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DRINKING WATER IN CITIES: ITS BENEFICAL AND ITS DEADLY QUALITIES.

By THEO. S. CASE, Kansas City, Mo.

POTABLE waters in cities are obtained from [illegible] and are usually

[illegible]

appear later.

A good, drinkable water is described as follows: "It is perfectly colourless and transparent, without smell or appreciab[le] taste, but agreeable and not insipid or fl[at]; does not lose its clearness by boiling, a[nd] leaves a very slight residue upon evapo[ra]tion." Drinking water, in addition to fr[ee]dom from all organisms, fr monia, nitrous acid nd sulphurett g, rogen, should not eeed eighteen t ty degrees of hardss.

Rain waters naturally the EA of all for ordinary se; but unless pains are taken in clecting and st ery, it is liable to cotmination from ty of sources, such s absorption al erious vapours and purities from th sphere of localities rgely occupied e nufacturing estab ments, smelter s, &c., also from t dust, organic s and other depos washed from r to the cisterns; n from the salts rd d and copper diss'd out of the m s roofs of building nd from foreign y s more or less offe e falling thereo under going decosition. Rain wa s also, from its tness,"—that is e nce of salts and oical compounds e liable to underg mentative chang n hard water, as as more ready to le chemical combions with metals s, and other subces.

Well spring waters, w usually contain ble quantities o compounds oe, soda, potash, m a, and alumina, h are required in a onomy of the em and which r th them "hard," in consequence of s sparkling an ater thirst-relievi alities, more aple as drinking wa an any other; cities are not only liable to cont excess of these sal ssolved from t in passing throug but are also fa likely to be conta ed to a highly erous degree by se s, waste of fac and other filth, wh may be presen poisonous amounts w out imparting the water either y le isant taste ll, and even withou colouring it least.

River is usually less so an rain water more so than well er, the latter tion being caused by partial and l decomposition of hemical com and the consequent position or p tion of their bases. is also far argely contaminated organic sub than either of the kin f water before ced, and is rarely e found per ansparent in colou erfectly att to the Howe it happe there are compens in the ca er water which do o btain in ei e others, and which lt in its pr n to a far greater ext than is u own. Among them the fishes, fr other living creatu and ani- r which subsist upon organic ntained in it, and also natural of decay themselves sequent combination with oxygen in aters, such as nitric a, which is isoptic, carbonic ac ammonia, h escape from the wa into the re. In addition to t it may be at even from the m populous proportion of deleter us matter lowing into an adja t stream, wentieth in volume, is small as with the whole volu of water d is so purified by o ation and uses, that an analys shows an ngly small quantity a given of the mixture within few miles source of the contamin on.

tly pure water, such, example,

[illegible]

tend at least retinism, and scrofulou iseases of kinds. Whether this is o or not, ll established that water containing portions of the s s of lime bon acid gas are more reeable to as well as more conduc to health. we conclude that in r normal n it is probable that t waters of wells and springs are preferable for drinking purposes to either of the others.

The consideration of the deleterious constituents of the potable waters of cities is a work of no small importance, and requires more time than I shall be able to bestow upon it this evening. But I shall endeavour to be sufficiently comprehensive in my remarks to excite an interest in the subject, which may result in some good to the community.

Cistern waters, as has been remarked, are liable to be contaminated by the gases, vapours, and other impurities of the atmosphere, which will be admitted to be by no means inconsiderable when we remember that the vapour arising from the ocean contains common salt and perhaps other mineral constituents in sufficient quantities to render it medicinal miles inland, while over large cities, where numerous manufactures are carried on, the gases arising therefrom modify the lower atmosphere very perceptibly, as is manifested in their discolouring and destructive action upon the materials of which the buildings and other structures are composed. Such mineral ingredients, when found in rain water in a much greater proportion than in ordinary well water, *i.e.*, in the proportion of more than fifty grains to the gallon, are necessarily injurious. But the principal sources of harm are the organic impurities arising from the decomposition of animal and vegetable substances, either washed in from the roofs or accidentally deposited therein, and from organisms floating in the air and precipitated by rain or snow. The former impurities may be filtered out or otherwise removed; but these minute organisms pass through all kinds of filters hitherto devised, and by their rapid propagation become the source of many diseases usually attributed to other causes. It is quite remarkable that some of these poisonous microscopic organisms are only found in closed wells and cisterns, while others are only found in those which are open and exposed to the action of the atmosphere. Among the deleterious organisms found in impure cistern water are Beggiatoa alba, schyzomycetes, the bacteria, monads, vibriones, and all organisms free from chlorophyll and promotive of decomposition of organic matter Sanitarians differ as to the amount of organic matter, such as nitrates, ammonia, &c., which may be present in potable waters without rendering them unwholesome, but it is safe to say that when such contamination amounts to more than two or three grains of organic and volatile matter to the gallon, or ten to fifteen parts of chlorine in a million parts of water, such water should be condemned as unwholesome. And yet people drink with impunity, for years together, water containing larger proportions of organic matter than these. The answer to this is that "soil as well as seed" is required to produce a crop The River Pollution Commissioners appointed by the British Parliament class as "suspicious" all stored rain water.

The water of wells is liable to be contaminated in a variety of ways without being affected in appearance, taste or smell, and it is not unusual to find, abounding in wells whose water has been regarded by those using it as especially pure, sweet, and wholesome, the elements of the most virulent and deadly blood poisons. These impurities may in part be traced to animal and vegetable substances thrown into the wells from the surface, through carelessness or malice, but the most deadly of them unquestionably come from the leachings of sewers, stables, and cesspools in their immediate vicinity. Public wells in crowded localities, and where horses and other animals are watered, are most liable to such contamination. I have in my possession the reports of a number of the Boards of Health of various cities in different parts of the country, north, south, east, and west, and the unanimous verdict of them all is that most of the well water in cities is more or less contaminated by these means, and that in by far the greatest number of cases the outbreaks of typhoid fever, diphtheria, and other zymotic diseases are due to the admission into the system of poisonous organisms by drinking well water impregnated with filth filtered through the ground in this way. The investigations of the British Health Commissioners elicited the fact that scarcely a well could be found in any of the beautiful, charming towns of England that was not an absolute source of disease to those using its waters, and that the older the town the more certain they were to find its waters thus contaminated and its death rate higher than in the newer localities. The researches of sanitary commissions in this country prove the same thing, and the reports from Providence, R.I., Rochester, N.Y., Dayton, Ohio, St. Paul, Minn., and Denver, Colo., all concur with the greatest unanimity in attributing the epidemics of typhoid fever, diphtheria, &c., which have scourged them respectively, to the same cause. In London another disease has recently made its appearance in crowded districts, which is regarded as a new form of Cyprus fever, and chargeable to impure water.

The nature of the soil upon which a town, or any portion of it is built, has much to do with its healthfulness in the matter of well water. For instance: it is easy to see that a loose, porous, or sandy soil is more readily permeated by fluids of all kinds, whether deleterious or not, than a dense, compact, and tenacious soil, and that the former is less likely to prove an efficacious filter than the latter It is impossible to lay too great a stress upon this subject, and yet time will not admit of further discussion of it. In view of the fact that as a rule people are more fatally attached to their favourite wells than to any other of nature's gifts to them, it may be stated that some analyses made by the celebrated Dr. Frankland of well waters in England noted, famous for their sweetness of taste, sparkling brilliancy of appearance, and supposed dietetic wholesomeness, revealed the fact that so great was the amount of organic impurity present that the water was actually worth in the market two dollars per ton as manure

While such a degree of filth contamination may not exist in many localities in this country, still revelations have been made by labourers, in excavating for cellars and foundations of buildings, even in some of the cities of the West, which have too clearly pointed out almost equally disgusting and alarming conditions.

The British Commission before referred to classed as "dangerous" the water of all shallow wells. Prof. Phipson regards the presence of phosphoric acid in well and river waters as undoubtedly a bad sign; and Dr. Frankland concludes that the development of fungoid germs cannot take place without the presence of phosphoric acid, or a phosphate, or phosphorus in some form of combination, and that water, however much contaminated, if free from phosphorus, does not produce them. Hence, we have this, in addition to other poisons, to look out for in our investigations of drinking water.

The deleterious qualities of river water are derived both from the decomposition of animal and vegetable matters, and also from the putrescent and putrescible substances carried into it by springs and brooks, sewers, drains from factories, &c., and consist of organisms similar to those described as existing in rain and well waters. To show to what extent the water of rivers is contaminated in passing by or through large cities it has been found by analysis that the Seine nearly doubles its proportion of mineral ingredients in passing through Paris, while its impregnation with organic matter is also largely increased. The River Thames receives so much organic matter from the sewers, factories, &c., of London as to render its waters below the city highly offensive, though above it its water is excellent in quality. Dr. Phipson analysed some water taken from the River Dart, which was so contaminated by sewage and refuse from chemical works that it poisoned and killed the fish. As above remarked, however, much of the impurity thrown into running streams is oxidized and rendered harmless within a few miles below the source of contamination.

Organic matters are largely present in all river waters, some of which are harmless even in large quantities, while the presence of others, such as putrid organic matter, numerous bacteria and micrococcus and minute white fungoid growths are, according to the best authorities, sources of imminent danger. The presence of nitrous acid is also to be regarded as a very serious matter. The British Commission already referred to classed as "dangerous" all river water to which sewage gains access. It may here be remarked that much of the organic and colouring matter found in river water is due to living green algæ and the products of the decay of leaves and other vegetable substances, which are comparatively harmless.

Thus it appears that each of these kinds of water is injuriously contaminated by the air or soil of cities to a degree and with a class of poisons almost impossible in the country, and that the water of wells in cities is to be regarded with most suspicion.

Resuming the subject of potable waters in general, we take up the consideration of the micro-organisms, heretofore spoken of, as regards their deleterious action upon the human system. Professor Barnard, in speaking of them, says in substance: The Infusorians, whose unaccountable readiness to spring up wherever decaying organic matter existed, first suggested their name, are found chiefly in fresh water lakes, rivers, and smaller streams, where they multiply in myriads, and are constantly swept about by the current. "It is commonly thought that pure drinking water is filled with these microscopic creatures, and it is sometimes said that they constitute the life of the water. All this is the opposite of the facts. Pure water is not inhabited by organisms; on the contrary, stagnant or impure water alone affords them subsistence. They hasten the destruction of the dead animal and vegetable matters the waters may contain, causing for the time being an infusion or fermentation of the liquid in question." "While their devouring work is a 'bottling up' of injurious and infectious matters, thus purifying our world, the substance their little bodies may contain and their parasitic action, when inoculated into the bodies of higher living organisms by contact, inhalation, eating, drinking, &c., render some kinds extremely dangerous as conveyers of the various contagious diseases."

It has long been taught by Prof. Austin Flint and others that the source of typhoid fever is a specific poison propagated through the alvine evacuations by contamination of the drinking water and atmosphere. The Boards of Health of Providence, Rochester, Baltimore, Cleveland, Dayton, Toledo, Minneapolis, Milwaukee, Denver, and Savannah, now in my possession, and in fact, all medical authorities, agree that such is the case, and that as our cities grow older their citizens go on storing up elements of destruction which nowadays only develop here and there cases of typhoid fever, diphtheria, and other dreaded diseases, but which, when the soil becomes impregnated beyond its capacity of neutralising the poison and imparts it unchanged to the air and drinking water, will produce just such horrible epidemics as have been known in the crowded cities of Europe and the East.

They also agree that most of these diseases have their origin in living organisms that chemistry would wholly fail to discover. Dr. O. W. Wight, of Milwaukee, states the case thus: "A few spores, invisible to the naked eye, of some deleterious cryptogam may enter the stomach with the drink, and there take root and increase into a growth of fatal disease. The ova of microscopic animalcules, or animalcules already full grown, may enter the system with drinking water and feed upon us till we die." Prof. Tyndall tells us that the spores of the *bacillus anthracis* killed nearly a thousand human beings, and more than 50,000 animals in five years in the provinces of Norgorod. Dr. Detmers, of Illinois, discovered in his investigations of hog fever, or cholera, a new order of bacteria or bacillus, which he believed to be the true seeds of this fatal disorder. This bacillus he determined by observation and experiment to be conveyed from one animal to another by means both of the air and the drinking water, which latter means of communication was conclusively shown by the fact that the course or progress of the contagion was down the stream in every instance, rather than the reverse.

It is apparent to all that the nature of the soil and the relative positions of the contaminating source and the well or stream, govern to a great extent the proximity that may be allowed between such objects. Shallow wells as a rule are more impure than deep ones. Wells, whose water comes from the surface of the first stratification of rock reached in digging, are naturally affected by whatever impurity gravitates into them. Wells in level ground without rock will drain a greater or less area, according as the soil is porous or not. Dr. A. N. Bell says that "the drainage of such a well extends from two to five feet in every direction for every foot in depth. Hence a well in compact soil, twenty feet deep, will drain a circumference eighty feet in diameter; in a porous soil a well of the same depth will drain a circumference two hundred feet in diameter, the well being in the centre."

It is generally believed that in passing or percolating through soils, especially those which are porous or sandy, the impurities of the foulest waters are removed, but such is far from being the case with the micro-organisms and subtle poisons resulting from putrefactive decomposition. These no filter can remove This is clearly shown by the results of the chemical analysis of certain wells in the typhoid fever sections of Rochester, New York, by Prof. Lattimore. The soil underlying that city varies in density, but in all cases the water taken from these wells was clear, cool, sparkling, and contained no bad taste or odour, so that it might be regarded as thoroughly filtered, yet the analysis showed an average of 16·78 grains of common salt, and large proportions of free ammonia and albuminoid ammonia; thus disclosing beyond any question the disgusting origin of the water, or at least of its contaminating qualities.

Having thus examined the whole subject in a general way, the conclusions arrived at are that in cities fresh rain water, when obtained with proper precautions is the purest drinking water, river water next, and well water the most likely to be contaminated by dangerous substances and the most liable of all to deceive consumers; but that all of them contain greater or lesser amounts of deleterious ingredients, and that some of them are disgustingly foul and unwholesome.—Extracted from the *Kansas City Review of Science.*

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ESTABLISHED 1ST MAY, 1862.

Past Presidents:

SIR DAVID BREWSTER, K.H., LL.D., F.R.S., &c., from the establishment of the INVENTORS' INSTITUTE, till his decease, February, 1868. LORD RICHARD GROSVENOR, M.P.

President, SIR ANTONIO BRADY.

THE SESSION 1879—1880

Members' Meetings will be held at 8.15 p.m. on Thursdays, January 8th and 22nd; February 5th and 26th March 11th and 25th; April 8th and 22nd; May 6th; and June 3rd.

At the meeting on the 22nd January, "Miners' Safety Lamps," by Mr. Purdey.

Annual General Meeting, Thursday, May 20th, at 4 p.m., unless otherwise arranged.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

Proceedings of the Institute.

[illegible] of Proceedings at the Inventors' Dinner will be [illegible] column.

Monthly Notices.

Steel from Cleveland Ores.—At the general meeting of the Newcastle-upon Tyne Chemical Society, Mr. R. C. Clapham, the President, drew attention to the manufacture of steel from the Cleveland ores. From this and the discussion which followed it appears that the elimination of the phosphorus from the iron is due to the magnesian limestone used in the lining of the convertor.

Solidified Bromine.—M. Philipp, at the suggestion of Rammelsberg, has redetermined the point at which bromine solidified. His process is described in *Ber. Berl. Chem. Ges.* for July. M. Philipp finds that purified bromine solidifies between − 7·2 7·3. It has a brown colour and a conchoidal fracture, assuming a grey colour and a crystalline structure on exposure to the air.

Gold employed as a positive pole in sulphuric acid is rapidly oxidized and dissolved, according to M. Berthelot in *Comptes Rendus* and *Annales de Chimie.* This takes place only under the influence of the galvanic current.

Artificial Diamonds.—Mr. James Mactear, of the St. Rollox Chemical Works, submitted to the Glasgow Philosophical Society on Wednesday, the 17th inst., the results obtained by him after thirteen years' investigation into the artificial production of the diamond. Mr. Mactear has obtained specimens of pure transparent carbon having the refractive power of diamonds, which resist the intense heat of the blowpipe flame and the action of acids and alkalies.—*Athenæum.*

The Phrenologists intend starting a fresh journal with the new year.

The Psychological Society has dissolved itself in consequence of the death of Serjeant Cox.

Climatic Effects on Fruits, Flowers, and Herbs.—M. Nicolas de Nusakine, in *La Correspondance Scientifique*, maintains that the aroma of fruits increases with the latitude, while the sweetness decreases. The foliage and flowers of Northern trees are always vivid, and herbs are said to contain more essential oil in Norway than in Southern Europe. This is supposed to be due to the prolonged light of the summer months in Northern climes.

Phylloxera Vanquished.—M. Dalmas—so *Les Mondes* informs us—has succeeded in destroying the phylloxera by wrapping thin copper wire round the stems of the vine, and passing a current from a powerful voltaic battery through it. Both the mature insects and their eggs are said to be completely disorganised by the electricity.—*Athenæum.*

The death of M. Michel Chevalier, the well-known writer on political economy, is announced.

To dissociate the metalloids by exposing them to the influence of the extreme temperature, which can be obtained by concentrating the solar rays upon them by means of a gigantic metallic reflector, is proposed, in the *Archives des Sciences*, to be effected by M. Raoul Pictet, whose name is connected with the solidification of the gases.

Planets and Comets.—Now that we are so soon to enter upon a new year, it is curious, says the *Athenæum*, to look back a hundred years and reflect that at that epoch the number of known planets remained the same as in ancient times; since then, Uranus and Neptune, besides the whole group of small (now two hundred and ten in number) planets, have been discovered, whilst Mars has been found to be attended by two satellites, and three have been added to those of Saturn over and above the five known in 1780.

Dr. Percy, who it seems has resigned the position which he has so long and so ably filled as Professor of Metallurgy in the Royal School of Mines, objects to being removed to South Kensington. So do we, and we hope something will be done to prevent this piece of absurdity. The extreme west of London is an improper place for such an institution.

Lontin's incandescent wire lamp appears likely to solve the problem of applying electricity with economy as an illuminating agent. M. G. E. Hospitalier, in *La Nature*, describes this lamp, which consists essentially of an helix of platinum wire placed between two elastic terminals, which, when connected with the battery, elongate or contract the helix according to the amount of electricity used.—*Athenæum.*

The Scientific Review

JANUARY, 1880.

THE INVENTORS' DINNER, 1879.

THE sixth annual Dinner of inventors, and members, and friends of the Inventors' Institute took place at St. James's Hall, Piccadilly, on 27th November, 1879; Sir Antonio Brady, President of the Institute, in the chair. Amongst those present were Mr. Wheelhouse, Q.C., M.P., Admiral Selwyn, R.N. (Vice-President), Mr. F. H. Varley, C.E., Mr. F. W. Campin, F.R.S.L., Mr. T. Waller, C.E., Mr. Newton Wilson, Mr. M. Zingler, F.C.S., Mr. J. Faulding, C.E., Mr. F. Braby, F.C.S., Mr. H. Studdy, Dr. J. M'Grigor Croft, Mr. J. L. Pulvermacher, Mr. J. Cadett, Mr. H. G. Hellier, Mr. J. P. Cutts, Mr. J. E. K. Cutts, Mr. T. Morgan, Mr. J. Greenfield, Mr. T. Blanchett, &c. The list of stewards also included the names of Sir Henry Bessemer, Sir Arthur Cotton, K.C.S.I., &c., Mr. Cromwell F. Varley, F.R.S., M.I.C.E. (vice-president Inventors' Institute). Mr. R. Richardson, C.E. (past treasurer Inventors' Institute), Sir H. De Burgh Lawson, Bart., &c., Mr. J. S. Farmer, C.E., Mr. J. Saxby, CE., Mr. S. Courtauld, Mr. W. Dempsey, C.E., Dr. Frank Scott, Mr. G. E. Pritchett, F.S.A., and Mr. D. J. M'Lauchlan.

After the dinner, which was a very excellent one well served, the CHAIRMAN proposed "the Queen and the Royal Family," which was loyally responded to.

The CHAIRMAN next gave "The Legislature."

Mr. WHEELHOUSE, Q.C., M.P., in responding to this, expressed regret that there was not a representative of the Upper House present, but remarked that that branch of the Legislature could take care of its own interests very well. As far as the House of Commons was concerned, he was sure its members felt that, as the elected of the people, they had large interests in their care, and that they never forgot that those interests required their most sedulous attention, but were anxious to bring that attention to bear even upon the most minute details. It should be also remembered that, as members of the Imperial Legislature, their first care should be to realise the fact that they had a duty to perform to every class of society, taking care to keep the level between the one and the other, so as not to allow either to get an undue prominence. The platform of our commercial interests was, after all, the most important one for this country, and prominent amongst these were industrial progress and invention.

The CHAIRMAN next gave "The Army, Navy, and Reserve Forces."

Admiral SELWYN, in acknowledging the toast, remarked, in reference to the Navy, that so many attacks had been made with regard to the present construction of ships that he was afraid that if inventors did not give them something which would remedy the present state of things the toast of the Navy would not continue to be received so enthusiastically as it was at the present time. (Laughter and cheers.)

The CHAIRMAN then gave the toast of "The Inventor's Cause," which he said was the cause of the nation. On the inventive genius of a people must depend its future trade and commerce. Unless we could undersell our neighbours by inventing better machinery, and promoting better manufactures and an improved taste among the people, this country "must go the wall." An endeavour was being made to induce the Government to give them what he believed would be one of the greatest blessings to this country—a good patent law. The great invention of Dr. Siemens was brought to this country because the German patent law at that time was worse than that of England. The genius of artizans should be encouraged as much as possible, and he believed that most of the inventions of this country had come from that class. It had been falsely said that patents were monopolies, but they were no such thing; they were simply a due reward to those who merited it. They now had £150 to pay for a patent, and at present what was obtained was simply a license to go to law.

Mr. CAMPIN, in responding to this toast, stated that he was present under all the pressure of deep domestic bereavement, and should have asked to be excused from coming to a convivial meeting on that account, if he had not felt that it was his duty as Secretary of the Inventors' Institute to be present at all important gatherings having reference to the inventor's cause, which he deemed a high and holy one, and one having such a direct bearing on the prosperity of the nation that it was his manifest duty to be present; for it should be borne in mind that although everyone approved of the efforts of successful inventors, and no one rejected the practical benefits which were showered upon them by the operations of inventive genius, yet there were not many persons who were ready to come forward and work heart and hand for the cause like Sir Antonio Brady, Admiral Selwyn, and Mr. Varley. He was much pleased that that world-renowned inventor, Sir Henry Bessemer, who was a very old member of the Inventors' Institute, had placed his name on the list of stewards this year. He was sorry not to see him amongst them that night, though he was not surprised, as he knew that Sir Henry had no great liking for public meetings of any kind; however, it gave him much satisfaction to think that such an eminent inventor went with them heart and hand. Before he sat down he should like to remark that this dinner, like the five preceding it, was really and truly an inventor's dinner, and all who wished well to the inventor's cause were welcome to come, whether they held the same views on Patent Law reform as the Inventors' Institute, or had other views on the subject. (Applause.) The only creed to be held was promotion of invention and industrial improvement, by according justice to inventors. (Applause.) And he was sure that no efforts of statesmanship would do so much to alleviate the effects of depression of trade as this would; in short, it was the great practical question of the day, and it was not too much to say that amendment of the existing patent laws was absolutely necessary in order that the trade and commerce of the country should be maintained. (Cheers.)

Mr. H. BROADHURST said that the class he represented took a deep and increasing interest in this question, which was evinced by the unanimity displayed at their last congress at Edinburgh, in September, as to the necessity of a reform in the Patent Laws. This was not altogether due to pressure on the part of the officers of the congress, but to the extraordinary depression of trade under which we had suffered during the last two or three years. Workmen had learned many lessons, and there was no lesson they had more thoroughly learned than this one —that in order to maintain our position amongst the commercial and manufacturing nations of the earth, England must continue to improve in machinery and in every other branch of production. He had seen a paragraph in the newspapers showing that the Americans during the past twelve months had taken out two-thirds more patents than had been registered during the same period in England. The cause of this was that the American Government did all it could to promote the inventive genius of the people; but our patent laws seemed to be drawn with the idea of discouraging that genius. He hoped the Government would not be permitted much longer to neglect this important subject. For the last three sessions the Government had introduced a new Patent Bill, and each Bill, as far as he had followed them, had been better than the previous one. He hoped that now the Attorney-General had given up accepting briefs in private practice, and was, he understood, devoting all his great talents to the service of the Government, a good, sound, healthy, and practical Patent Law Reform Bill was one of the questions upon which he was engaged. He was informed that the present Government intended to go through another session of Parliament, and in the forthcoming session they were determined to pay some attention to English interests at home; and if this be true, they had a right to expect of her Majesty's Government that this all-important subject should be one of the foremost questions to be dealt with in this domestic programme. He believed that the Attorney-General was desirous of passing a Bill on this subject, and he urged them to worry whatever Government might be in power until such a measure was passed. (Cheers.)

Mr. Wheelhouse advised that a Bill should be drawn up and printed, and if this were done he promised to take charge of it.

The Chairman next gave the "Inventors' Institute."

Admiral Selwyn, Vice-President, in reply, gave a detailed account of the proceedings at a congress which was held at Paris on the Patent Laws, and contended that the progress of the United States in arts and manufactures was wholly due to its protection of inventions. The result of the Paris Congress was that resolutions were passed which had been accepted as a *projet de loi*, which had been submitted to every Government as a basis of international law on industrial property. It was useless to give people technical education unless the results of that education were protected. The reform of the Patent Laws would do more to increase the prosperity of this country than any measure relating to the tenure of land, and many patents were now lost owing to the inability of the patentee to proceed with them. In 1852 the patent tax was reduced from £350 to £175, and whilst for some years previously to that date the number of patents registered was at the rate of 68 per annum, since 1852 the number had averaged 3,544 per annum.

Mr. F. H. Varley (Chairman Executive Council Inventors' Institute) also briefly responded, by remarking that whatever views any one might hold on various points of amendment of the Patent Laws, he felt sure they must, if desirous of forwarding the good cause, be more or less in harmony with those of the Institute, which did not seek to aggrandise the inventor at the expense of the public, but simply to render the efforts of inventive genius more and more effectual for the public good (Cheers). Any other notions of its operations were misconceptions, and as an old member and office-bearer, he thanked them for coupling his name with the toast.

Mr. Newton Wilson also responded in appropriate terms.

Mr. Pulvermacher then proposed the "Executive Council and Officers of the Inventors' Institute."

This was responded to by Mr. M. Zingler for the Executive Council; Mr. F. W. Campin, as Secretary; and Mr. J. P. Cutts, as Auditor.

At this stage of the proceedings Sir Antonio Brady left the chair, which was taken by Admiral Selwyn.

Mr. T. Waller then proposed the "Dinner Committee," which was responded to by Mr. J. [illegible]field and Mr. T. Morgan, up[illegible] there was much applause; and with the toast of the "Press" and the "Two Chairmen of the Evening," responses thereto, and some musical performances by the members of the Institute, the Sixth Inventors' Dinner ended.

FOREIGN SCIENCE.

Meteorologists are still occupied with the late wet and cold summer, during which, according to M. Renan, as registered at his observatory in the Park of St. Maur, outside Paris, the readings of the thermometer during July corresponded to the summers of 1758, 1795, and 1816. What is not less remarkable, the direction of the winds were nearly the same. The low temperature this season has not accompanied the north-west winds, but those from the west and south-west, which are naturally warm. M. Renan explains the matter as the consequence of the winds of Africa instead of passing westward, according to habitude, having deviated to the east of Europe. A corresponding phenomenon occurs at Senegal: the warmer the upper part of the river, the cooler is it at the seaside. M. Renan believes that severe winters are not the result of arbitrariness, but are constituted by groups of four or six around one more vigorous, and which he calls the central winter. He attributes the grouping to cosmical causes; perhaps deviations in the march of the winds might be nearer the truth. In any case, the alteration in the direction of the winds this summer has produced exceptional migrations of butterflies, which have infested the west of Europe since June, going southward. In some cases the sky was obscured by their passage, and they formed singed masses at the base of lamp-posts They flew in groups at the rate of ten miles an hour; if they encountered a wall, the column rose vertically till it was crossed; then, after a moment's hesitation, the march southward was resumed without a stop to repose on a flower Strange, no butterfly of the same species in the locality over which the group passed joined the migration.

A student school-mistress, aged 16 (says the Paris correspondent of our well-conducted contemporary, the *Kansas* (*U.S.*) *City Review*, from which we quote), was admitted into hospital, suffering from severe headache; she went to bed, and in the morning when she awoke she was completely blind. Dr. Abadie perceived that the surface of her body had become insensible; the forehead, neck, arms, and limbs, when touched with a lance, felt no sensation; no blood even flowed. He tried Dr. Burg's method, metallotherapy, and placed three pieces of gold on the left temple. In the course of fifteen minutes the patient commenced to see indistinctly; at the end of half an hour perfectly, but only with the left eye, the right remaining refractory to the metallic treatment. The patient was next placed on the insulated stool of an electric machine, and some sparks were eliminated from the neighbourhood of the orbit of the eye, In a quarter of an hour an amelioration was apparent, and continuing the plan every second day during a week, sight was restored.

M. Young has been studying the effects of poison on crustaceæ. Lobsters, cray-fish, and crabs are less susceptible to the effects of poison than vertebrate animals. They live very well in a solution of strychnine, because they eliminate it, but nicotine acts as readily on them as on us.

New colours have been extracted from cabbage and coffee.

"Sermonic Fancy Work," a little volume of smart papers on nursery rhymes, by Rev. John Paul Ritchie, of St. Helen's, which is out of print, is about to be re-issued by Messrs. W. H. Whittingham and Co., in a new form.

Proceedings of Societies.

ROYAL SOCIETY.

Nov. 20th.—The President in the chair. Mr. G. Matthey was admitted into the Society. The following papers were read:—"Experimental Researches on the Electric Discharge with the Chloride of Silver Battery: III. Potential at a Constant Distance and various Pressures, Tube Potential, Nature and Phenomena of the Electric Arc," by Mr. Warren De La Rue and Dr. Müller; "Researches on the Action of Organic Substances on the Ultra-violet Rays of the Spectrum: III. Essential Oils," by Messrs. Hartley and Huntington; "Preliminary Note on Magnetic Circuits in Dynamo- and Magneto-Electric Machines," by Lord Elphinstone and Mr. C. W. Vincent; "Preliminary Report to the Committee on Solar Physics on the Evidence in favour of the Existence of certain Short Periods common to Solar and Terrestrial Phenomena," by Messrs. Stewart and Dodgson; "On Definite Integrals involving Elliptic Functions," and "Values of the Theta and Zeta Functions for certain Values of the Argument," by Mr. J. W. L. Glaisher; "On the Normal Paraffins," Part III., by Prof. Schorlemmer; "Further Particulars of the Transit of Venus across the Sun, December 9th, 1874, observed on the Himaylaya Mountains, Mussoorie, at Mary Villa Station," Note III., by Mr. J. B. N. Hennessey; "On the Solubility of Solids in Gases, Preliminary Notice," by Messrs. Hannay and Hogarth; "On certain Definite Integrals," by Mr. W. H. L. Russell; "On the Action of Nuclei in producing the sudden Solidification of Supersaturated Solutions of Glauber's Salt," by Mr. C. Tomlinson; "On the Geometric Mean in Vital and Social Statistics," by Mr. F. Galton; "On the Law of the Geometric Mean," by Mr D. M'Alister; and "Correction of Errors in his Paper on Diurnal Variations," by Mr. F. Chambers.

Nov. 27th.—The President in the chair. The following papers were read:—"On the Changes in Pepsin-forming Glands during Secretion," by Messrs. Langley and Sewall; "On the Structure of Serous Glands in Rest and Activity," by Mr. J. N. Langley; "Report on Phyto-Palæontological Investigations of the Fossil Flora of Sheppey," by Baron Ettingshausen: "A Memoir on the Single and Double Theta Functions," by Prof. Cayley; "On the Reversal of the Lines of Metallic Vapours," VII.; and "On the Spectra of Sodium and Potassium," by Profs. Liveing and Dewar.

Dec. 1st.—The anniversary meeting was held, the President in the chair. The statement of income and expenditure and the obituary list were read. The President delivered his anniversary address. The Copley Medal was presented to Prof. Clausius, the Davy Medal to M. Lecoq de Boisbaudran, the Royal Medals to Prof. Ramsay and Mr. Perkin. The council and officers for the ensuing year were elected.

GEOGRAPHICAL SOCIETY.

Nov. 24th.—Right Hon. the Earl of Northbrook, President, in the chair. The following gentlemen were elected Fellows:—Ibraham Helmy Pacha, Sir H. G. Booth, Major-Generals R. Biddulph, E. G. Bulwer, J. W. Cox, and F. Moberly, Cols. M. Hunter, D. Macintyre, G. C. Thomson, and F. W. E. Walker, Majors R. J. Maxwell and Serpa Pinto, Capts. C. K. Brooke, E. C. Browne, Lord Gifford, H. C. Reynolds, W. Shepherd, and D. W. Stephens, Lieuts. J. C. Bell, J. Ross, and Lucien N. B. Wyse, Revs. C. Davis and Dr. J. O. Means, Messrs. W. E. Baxter, B. P. Bidder, T. Bird, J. L. Bradfield, J. W. Bryans, C. Clausen, L. Dale, C. J. Follet, G. B. Glover, W. R. Guinse, H. Hayes, C. E. Hodson, W. P. Hutton, A. C. Johnston, Lowenstein, A. Marshall, T. M'Clure, O T Olsen, W. G. Pedder, E. A. Petherick, C. M. Royds, W. H. Rodd, T. H. Sanderson, D. E. Saurin, R. L. S. Smyth, H. C. Stockley, M. J. Sutton, jun., F. Swanzy, F. Tayler, G. Waller, E. Wheeler, and J. S. Wilkinson. The paper read was "The Arctic Campaign of 1879 in the Barents Sea," by Capt. A. H. Markham.

Dec. 8th.—Right Hon. the Earl of Northbrook, President, in the chair. The following gentlemen were elected Fellows: Lieut.-General Sir J. M. Adye, Capt. H. S. G. Miles, Rev. J. Jordan, Messrs. J. T. Arundel, Mr. J. M. Flint, E. W. Johns, C. J. Longman, M. W. Mott, J. C. Rounding, A. W. C. Shean, M. Tait, G. Todd, J. M. Vickers, and F. Wyllie. The paper read was "A Visit to Nejd, Central Arabia," by Mr. W. S. Blunt.

GEOLOGICAL SOCIETY.

Nov 19th.—H. C. Sorby, Esq., President, in the chair. Messrs. E. K. Binns and J Dawson were elected Fellows. The following communications were read, "Supplementary Note on the Vertebræ of Ornithopsis, Seeley (= Eucamerotus, Hulke)," by Mr. J. W. Hulke; "On the Concretionary Patches and Fragments of other Rocks sometimes contained in Granite," by Mr. J. A. Phillips; and "On certain Geological Facts witnessed in Natal and the Border Countries during Nineteen Years' Residence," by the Rev. G. Blencowe

Dec. 3rd.—H. C. Sorby, Esq., President, in the chair. Rev. J. L. Carrick, Rev. T. Dowden, Rev. J. R. Taft, Prof. E W. Claypole, Messrs. Syed Ali, W. E. Baxter, A. R. Boyle, R. Gascoyne, G. M. Henty, J. Marshall, J. Martin, C. Maxted, E. Provis, T. W. Rumble, O. A. Shrubsole, S. R. Smyth, and W. N. Walter were elected Fellows The following communications were read: "On the Gneissic and Granitoid Rocks of Anglesey and the Malvern Hills," by Mr. C Callaway, with an Appendix on the Microscopic Structure of some of the Rocks, by Prof. T. G. Bonney; "Petrological Notes on the Neighbourhood of Loch Maree," by Prof. T. G. Bonney; and "On some Undescribed Comatulæ from the British Secondary Rocks," by Mr. P. H. Carpenter.

BRITISH ARCHÆOLOGICAL ASSOCIATION.

Nov. 19th.—Mr. T. Morgan in the chair. After the election of many new members, reference was made to the Saxon church of Escombe, near Bishop's Auckland, the discovery of which had been communicated to the Congress by the Rev. Dr. Hooppell. The building is entirely of Saxon date, all the walls being original and even the gables. The height, as is usual in buildings of this early date, is great for the size. This is in the nave 24 ft. 4 in., while the extreme length of nave and chancel is only 56 ft., width 14 ft. 4 in. The chancel arch is a plain semi-circle, and only 5 ft. 3 in. wide. All the walls are built of squared stones brought from the Roman station at Binchester (Vinorium), and the name of the Sixth Cohort has been met with built up among the walling. Escombe is a secluded village, and to this must be attributed the fact that the existence of this most interesting structure should have remained unknown until now. The plans will appear in the next part of the Society's *Journal*. Mr. L. Brock made mention of the proposal before the Italian Government to rebuild the front of St. Mark's, Venice. This work was strongly condemned, and a resolution to that effect was carried unanimously. The Rev. Prebendary Scarth reported the further discovery of important Roman remains at Bath, and Mr. C. Lord exhibited some remarkable earthenware pipes, with neatly worked joints, found under the Roman camp at Soddington, near Edgbaston, where, the chairman pointed out, similar remains were found in 1817. Mr. Turner described a curious class of biers remaining in some of the Norfolk churches, and Mr. Watling exhibited a large collection of transcripts of ancient glass, &c., from Norfolk and Suffolk. The Rev. S. M. Mayhew read an elaborate paper "On the Antiquities of the Isle of Man," referring especially to the interlaced crosses and the curious little churches known as "creels." The proceedings were brought to a close by the portion of a paper "On the Results of the recent Congress," by the chairman, but the conclusion had to be deferred for want of time

Dec. 3.—T. Morgan, Esq., in the chair. Several interesting documents relating to Wells Cathedral were exhibited by the Rev. Canon Bernard, among them being a little known grant by King Edgar of land at Stanton, Wilts, and attested by Dunstan and several dignitaries of the period. Mr. W. de Gray Birch described an inscription on an external buttress of the same cathedral, announcing thirteen days of pardon for all who might pray for the soul of John de Putney Mr. Mann described some remarkable Roman sculptures, consisting of architectural members, several very elaborately carved. These have recently been found at Bath. Mr. J. T. Irvine reported the discovery of the foundations of the long-lost bell-tower of Lichfield Cathedral. The ancient records report that this stood in the Close, and that it was burned in 1315, since which time its site has been unknown. It has been found on the north side of the cathedral, near the Chapter House, in excavating for a new stable in the bishop's grounds. A mass of calcined flooring tiles was first met with, covered with a coating of melted bell-metal, and aftewards the foundations of the massive walls. Mr. E. P. Loftus Brock exhibited a series of Italian salt-cellars of pottery of very diverse form, but identical with those noticed in English pictures of the fifteenth and sixteenth centuries, showing the generality of form in many articles of domestic use. The chairman concluded his paper on the results of the recent Congress, and Mr. G. R. Wright called attention to the much discussed question with respect to the birthplace of Anne Boleyn. He quoted from Spelman that she was born at Blickling Hall, and asserted that this might be taken as conclusive evidence, since he was so nearly a contemporary writer. The proceedings were brought to a close by a paper "On the Trethevy stone, Cornwall," by Mr C. W. Dymond. This is a cromlech standing on a low well-defined mound, and presenting no appearance of having ever been covered over. All evidence is in favour of the belief that it was built as it now stands. A hole in the top stone may have been to receive the base of a cross in mediæval times.

NUMISMATIC SOCIETY.

Nov. 20th.—Dr. J. Evans, President, in the chair. The Rev. Canon Pownall exhibited a coin of one of the types of Edward the Confessor struck at Thetford, but bearing instead of the name of Edward that of Eadred Rex, and on the reverse Atser on Thetfor—Atser being a known Thetford moneyer of Edward the Confessor. Canon Pownall also exhibited some counterfeit base shillings of Edward VI. without any trace of silver remaining upon them. Mr. P. Gardner read a paper "On some Coins brought from Kashgar by Sir Douglas Forsyth." Among these were two of iron, probably of a local issue. One of them bore a name resembling that of Hermæus, the Greek king of Bactria, in Aryan letters, and on the reverse some Chinese characters. Mr. H. Howorth supplemented the paper with a short dissertation on the ancient geography of Kashgar. Mr. J. White read a paper "On the Iron Money of the Japanese," and exhibited a selection of twenty specimens, together with a bronze coin of the same size, equal in value to the twenty iron coins. Mr. White said that although the iron coins were only worth about the hundredth part of a farthing a piece, some small articles were to be purchased with them, but that they were chiefly used for the giving of alms and as offerings to the gods.

STATISTICAL SOCIETY.

Nov. 18th.—T. Brassey, Esq., M.P., in the chair. After the election of seventeen new Fellows, the President delivered his inaugural address, the subject being "Agriculture in England and the United States." At the close of the address the President presented the Howard Medal and £20 to Miss Beatrice A. Jourdain. The President then announced the subject of the essay of next year, viz., "The Oriental Plague in its Social, Economical, Political, and International Relations.

ZOOLOGICAL SOCIETY.

Nov. 18th.—Prof. Flower, President, in the chair. The secretary read a report on the additions to the Society's menagerie during June, July, August, and September. Letters and papers were read: Mr. H. O. Forbes, on the distribution of the Badger-headed Mydaus in Java; from Dr. A. B. Meyer, in which the habitat of *Cervus Alfredi* was stated to be Samao and Leyte islands of the Philippine group. Mr. E. R. Alston exhibited some mammals collected by Mr. W Ramsay, 67th Regiment, and one of the typical skulls of *Tapirus dowi* (Gill), which had been entrusted to him by the authorities of the U.S. National Museum. Prof. Flower made remarks upon the skull of a White Whale (*Delphinopterus leucas*) recently obtained in Sutherlandshire. Communications were read: from Mr. J. L. Taczanowski, on a new Synallaxis from Peru, which he proposed to name *Synallaxis fruticola*, and a new Myiarchus from the same country, proposed to be called *M. cephalotes*, and on some birds of interest recently received from Turkestan; from Capt. Shelley, on a collection of birds made in the Comoro Islands, received from Dr. Kirk at Zanzibar: the collection contained 186 specimens; a Zosterops which appeared to be new was named *Z. Kirkii*, in acknowledgment of the assistance rendered to ornithology by Dr. Kirk; by Capt. Shelley, on two new species of African birds. Lieut.-Col. H. H. Godwin-Austen read a description of the female of *Lophophorus Sclateri*, Jordon, from Eastern Assam. Communications were read: from Dr. Goodacre, on the identity of the common and Chinese geese; from the Rev. O. P. Cambridge, on some new and rare spiders from New Zealand, with characters of four new genera; on some African species of Lepidoptera, belonging to the sub-family Nymphalinæ, by Mr. W. L. Distant; and by Mr. R. G. W. Ramsay, on a new Oriole from North-East Borneo, which he proposed to call *Oriolus consobrinus*.

Dec. 2nd.—Prof. Newton, V.P., in the chair. The secretary read a report on the additions made to the Menagerie during October. Letters and papers were read: from Mr. E. L. Layard, advocating the desirability of a fixed scale of colour for use among naturalists in describing the plumage and pelage of birds and other animals; from Mr. R. B. White, on a mode of protecting plantations from the ravages of an ant (*Atta cephalotes*); from Dr. G. E. Dobson, on some species of Chiroptera from Zanzibar, with descriptions of new and rare species; from the Prince L. Lubomirski, on a collection of Shells made in High Peru by Messrs. Jelski and Stolzman; by Mr. G. F. Angas, on two new species of Helix (Eurycratera), from south-east Betsileo, Madagascar; by Mr. A. G. Butler, on some Arachnida of Madagascar and the Mascarene Islands, in which an account was given of a collection of spiders recently received by the British Museum from Réunion and Mauritius, through Mr. H. H. Slater; by Lieut.-Col. H. H. Godwin-Austen and Mr. G. Nevill, on two collections of Land Shells obtained at Perak and in the Nicobar Islands by Surgeon-Major E. Townsend and Dr. F. Stoliska; from Dr. A. Gunther, containing a notice of a collection of Mammals and Reptiles recently received from Cyprus by Lord Lilford; and by Dr. F. Day, on the Fishes of Weston-super-Mare.

ENTOMOLOGICAL SOCIETY.

Nov. 5TH.—H. W. Bates, Esq., V.P., in the chair. Mr. T. R. Billups was elected an ordinary member. Mr. W. C. Boyd exhibited a remarkable variety of *Aspilates citraria*, a specimen of *Cidaria testata* in which the hind wings were apparently absent, and a Noctua resembling *Hadena dentina*, but differing from that species in the form of the body. Mr. McLachlan read some remarks he had received from Prof. Forel relative to the sculptured stones on the shores of Lake Leman. Three principal types of markings were described, the first of which was ascribed to the agency of Tinodes. Prof. Westwood exhibited a series of drawings illustrating the economy and transformations of several species of trichopterous and other neuropterous insects; also drawings of some undescribed species of exotic heteropterous Hemiptera contained in the Hopeian collection; he likewise drew attention to a modification of the professorship which had been proposed by the Oxford Commissioners, whereby the science of entomology would probably be neglected, and which would to a certain extent render nugatory the intentions of the founder of the professorship and donor of the collections. Prof. Westwood also referred to the affinity of the genus Polyctenes. Mr. J. J. Weir exhibited some ants, apparently a species of Atta, which he had found in large quantities at Pisa, and which were peculiar in having collected around their nests large quantities of small empty shells of *Helix caputata* and *H. virgata*. Mr. Weir also exhibited a specimen of an Orgyia, stated on the authority of Mr. Gates to have emerged from the larval skin without passing through the pupal condition. Mr. W. L. Distant communicated a note relative to some Indian Hemiptera he had received from India through Mr. F. Moore for examination, with the names of the plants on which they were found. The following papers were also communicated: "List of the Hemiptera collected on the Amazons by Prof. Trail," Part I., by Dr. F. B. White; "Descriptions of New Genera and Species of Tenebrionidæ from Madagascar," by Mr. F. Bates; and "Descriptions of New Coleoptera from East Africa and Madagascar," by Mr. C. O. Waterhouse. Mr. Butler communicated a paper "On the Natural Affinities of the Lepidoptera hitherto referred to the Genus Acronycta of authors." From an examination chiefly of the larval characters, the author proposed to distribute the British species of the genus among the Arctiidæ, Liparidæ, Notodontidæ, and Noctuites.

CHEMICAL SOCIETY.

Nov. 20TH.—Dr. Gilbert in the chair. The chairman announced that a ballot for the election of Fellows would take place at the next meeting, December 4th. The following papers were read: "A Chemical Study of Vegetable Albinism: Part II. Respiration and Transpiration of Albino Foliage," by Mr. Church; "Contributions to the History of Putrefaction," Part I., by Mr. C. T. Kingzett; "Notes on Manganese Dioxide," by Messrs. C. R. A. Wright and A. E. Menke; and "On the Reaction between Sodium Thiosulphate and Iodine: Estimation of Manganese Oxides and Potassium Dichromate," by Mr. S. Pickering.

DEC. 4TH.—Mr. Warren De la Rue, President, in the chair. The following papers were read: "On the Comparative Value of Different Methods of Fractional Distillation," by Mr. F. D. Brown; "On the Influence exerted upon the Course of certain Chemical Changes by Variations in the Amount of Water of Dilution," by Messrs. M M P Muir and C. Slater; "On the Influence of Temperature upon the Decomposition of Barium chloride by Potassium Oxalate in Aqueous Solution," by Mr. M. M. P. Muir: "On α and β Phenanthrene Carbonic Acids," by Dr. F. R. Japp; and "On some Derivatives of Phenylacetic Acid," by Mr. P. P. Bedson.

METEOROLOGICAL SOCIETY.

Nov. 19TH.—Mr. C. Greaves, President, in the chair The following gentlemen were elected Fellows: Capt. C. K. Brooke, Rev. E. Carr, Capt. R. A. Edwin, the Earl of Northesk, Dr. J Robb, Messrs. W. B Fawcett, C. J. Harland, J. Lucas, H. Mellish, G. B. Nichols, T. H. Walker, and C. L. Wragge. The Reports on the Phrenological Observations for 1879 were read, the Botanical being by the Rev. T. A. Preston, the Entomological by the Rev. C. H. Griffith, and the Ornithological by Mr. J. Cordeaux. With the exception of a few days in the earlier parts of February and of March the temperature of 1879 has been almost invariably below the mean, accompanied with wet and little or no sun. Foliage has, as a rule, been excessively luxuriant and dark, "forming the most remarkable feature of the year"; but rarely has fruit been able to ripen, and the second shoots have frequently been weak and unhealthy. Flowering has invariably been late, as much as a month in some districts; the hay harvest often not completed till nearly the end of August, some still in "cock" in the moorland district of Staffordshire as late as September 30th; and the corn harvest not only extremely late, but the corn not properly ripened. With regard to insects, the two most notable occurrences have been the swarms of *Pyrameis Cardui* and *Plusia gamma*; both these species have been wonderfully numerous, especially the latter. The severity of the winter caused an almost unprecedented mortality amongst birds, a mortality most apparent amongst the Turdidæ and the Starlings. Spring brought little or no improvement; birds nested much beyond their average time, and in a vast number of instances the first eggs have been addled and destroyed by cold rains and an abnormally low temperature. The scarcity of young partridges is unprecedented. A paper "On the Meteorology of Zanzibar," by Dr J. Robb, was also read.

PHILOLOGICAL SOCIETY.

Nov. 21ST.—Dr. J. A. H. Murray, President, in the chair. Major-General Moberly, Messrs. J P. Postgate, H. Belcher, T. R. Gill, and T. C. Button, were elected members. Mr. H. Sweet gave a verbal account of Prof. Bugge's recent researches on Scandinavian mythology, tending to show that much of it was of recent origin, and borrowed from Greek and Jewish sources. Prince Louis Lucien Bonaparte read a paper "On Portuguese Simple Sounds, compared with those of Spanish, Italian, French, English," &c., accompanied by a printed table with the sounds in his own characters and in palæotype, each with an example in Portuguese orthography. The chief peculiarity was in the vowels, of which the Prince acknowledged fifteen, five being nasal, with a nasality different from the French. There were twenty consonants, mainly remarkable for their varied and peculiar orthography The orthography of Portuguese is about as anti-phonetic as English or French. There is no proper quantity of vowel, there is no musical accent, but an ordinary stress. The pronunciation differs from Spanish as much as Spanish from English. The pronunciation given referred to Lisbon only at the present day.

SOCIETY OF ARTS.

Nov. 24TH.—The first of the present course of Cantor Lectures "On Bread and Bread-Making," was delivered by Dr. C. Graham.

Nov. 26TH.—Lord A. S. Churchill in the chair. Fourteen candidates were proposed for election as members. A paper entitled "Suggestions for Dealing with the Sewage of London" was read by Major-General Scott.

DEC. 1ST.—Dr. C. Graham delivered the second lecture of his course "On Bread and Bread-Making."

DEC. 3RD.—Prof. Huxley in the chair. Six candidates proposed for election as members. The paper read was "On Apprenticeship: Scientific and Unscientific," by Prof. S. P. Thompson.

DEC. 8TH.—The third lecture of his course "On the Chemistry of Bread and Bread-Making" was delivered by Dr. C. Graham.

DEC. 10TH.—Sir J. D. Forsyth in the chair. Six candidates were proposed for election. Mr. W. Simpson brought before the society the result of some recent explorations in the Jellalabad Valley in a paper "On Art Vestiges in Afghanistan," in which he described some interesting discoveries he had made with regard to the ancient art of that country.

PHYSICAL SOCIETY.

Nov. 22ND.—Prof. W. G. Adams in the chair. Prof. Reilly and Prof. Heath were elected members. Prof. Guthrie exhibited a new photometer in its crude form, and demonstrated its action to the meeting. Prof. Reinold read a paper by Prof. Rucker "On a Suggestion as to the Constitution of Chlorine offered by the Dynamical Theory of Gases;" and Dr. Shettle read a paper "On the Influence of Heat upon certain Forms of Induction Coils, considered more especially in Relation to the Inductive Power which the Blood exercises on the various Structures of the Body."

SOCIETY OF ANTIQUARIES.

Nov. 27TH.—F. Ouvry, Esq., V.P., in the chair. Mr. Ouvry stated that Lord Carnarvon was prevented by indisposition from taking the chair. Mr. C. Knight Watson, secretary, stated that in the summer the council had appointed a committee, called the "Historical Monuments and Documents Committee," to consider what steps should be taken to carry out the valuable suggestions made by the President, Lord Carnarvon, in his address on St. George's Day. The council felt that the credit of the society was involved in not allowing these suggestions to lie dead. The committee, who had received great assistance in their labours from Mr. E. A. Bond, Principal Librarian of the British Museum, had drawn up a report in the shape of a memorial to the Lords of the Treasury, which had been adopted by the council and ordered to be submitted this evening for the information of the society, and then to be transmitted to the proper quarter. The secretary further stated that he had been instructed by the council to lay before the society a letter which had been forwarded by the President, at the request and in the name of the council, to the Secretary of State for Foreign Affairs with reference to St. Mark's, Venice. Messrs. O. Morgan, H. Reeve, C.B., and G. E. Street, R.A., addressed the meeting on the subject of St. Mark's and deprecated the alleged intention to restore the west front. Mr. Street warned the society that it would be necessary to exercise vigilance in ascertaining whether the instructions from the central authorities at Rome, especially as there seemed some conflicting jurisdiction between two departments of the State, were duly attended to at Venice. His experience told him that this could not be implicitly relied on. Mr. Ouvry exhibited a beautiful MS. of the Vulgate, probably of the thirteenth century, which had formerly belonged to Dr. Adam Clarke. Mr E. Freshfield communicated some remarks on an illuminated Calendar contained in six leaves of parchment, which had been brought for exhibition by Mr. Joseph Clarke, F.S.A. Mr. Freshfield believed this Calendar to have been drawn up soon after 1372, though there were entries as late as the seventeenth century. From its general character Mr. Freshfield conjectured it had originally been prefixed to a parish record, and this had reminded him of a similar Calendar which he had seen in the muniment room of the parish of St. Stephen's, Coleman-street. He had compared the two together, and by the kindness of the churchwardens of that parish he was able this evening to allow the Fellows to do the same, by bringing for exhibition the curious parish books. It was to an account of these books that the remainder of Mr. Freshfield's elaborate paper was devoted The most curious is the Book of Records, which contains the Calendar in question, and of which the earliest portion is certainly not later than the reign of Edward IV. In addition to the usual fixed saints' days, which are more numerous than in Mr. Clarke's Calendar, it specifies some peculiar to the parish. The word "Pope" has been erased, and in one instance (probably in Mary's reign) reinserted. At the end of the Calendar follows an inventory of the goods of the church, under different headings, such as jewels, latten, pewter, missals, graduals, vestments, altar-cloths of work, towels of work, hangings for the altar, &c. The date of this inventory is 1466, and it is followed by another of the year 1542 It is very curious, with regard to the books in the latter inventory, that all those which were "not Salisbury" had been sold, as if in the latter part of Henry VIII.'s reign there had been some attempt to establish uniformity by restricting the "use" as far as possible to that of Sarum. Mr. Freshfield went into copious details, affording a most interesting glimpse into a London parish. These books appear to be in many respects the most important in the City of London.

DEC. 4TH.—F. Ouvry, Esq., V.P., in the chair. Mr. T. G. Elger communicated an account of two leaden coffins which had been discovered last August in a field called Tower Hill, about two hundred yards to the west of Sandy station on the Great Northern Railway. Mr. Elger conjectured that Tower Hill may be found to have been the cemetery of the Roman station. Mr. R. Day communicated an account of a leaf-shaped bronze spear-head, 23 in. long by 2¼ in. in the widest part of the blade, which had been discovered while dredging the river between Queenstown and Cork, in the Blackrock Reach, about two miles from Cork. It was stated that a similar spear-head had been discovered six months ago, but had been thrown away by the dredgers as valueless. Mr. G. Payne, jun., exhibited one of the most remarkable "finds" of Roman remains that have ever been laid on the society's table. The locality where they were discovered is the site of a Roman interment, at Bayford, near Sittingbourne, Kent, which two years ago (May, 1877), furnished the materials of an exhibition of scarcely inferior interest with which Mr. G. Payne favoured the society, and for which he received the appointment of local secretary. This second interment, which was opened on the 6th of November last, lay about twenty yards from the previous one, and nothing but the most zealous care of an accomplished antiquary and an experienced excavator could have exhumed the objects found in such marvellous preservation. Among the most interesting of these objects may be mentioned a square cinerary vessel of blue glass, of unusually large dimensions; a small pale greenish-blue glass jug, with a handle twisted at the rim into a loop; a pale olive-green glass bottle, height 9¼ in., with two handles, a very unusual feature; a bronze vase, a most remarkable object, height 10¼ in., extreme width 6¼ in. The handle is of massive metal, and on it, in high relief, is stamped the nude figure of a man, an uplifted sword in the right hand, in the left is the scabbard, and over the arm is thrown a cloak; under the right hand is a decapitated ram or goat, legs uppermost, with blood dropping from the neck, the head having fallen at the man's feet. Between his legs reclines an ox, and next the left leg is seen the head of a boar, probably animals destined for sacrifice. Above the man's head the decoration is continued up the handle. Here a goat is figured galloping, over it are two animals of some kind, and above them is the figure of a man, seated, holding a crook in the right hand The handle is encircled with a band of siver, and the rim is clasped by the heads of two birds, with eyes of silver, and the beaks drilled with holes as if to represent teeth. Along with these objects were urns of Upchurch and Samian ware, and a curious saucer of unknown delicate cream-coloured ware; there were also fragments of bronze strigils and a very curious kind of bronze rack, in the shape of the letter D, which seemed to have been used for suspending both the strigils and also a bronze bowl, of which fragments were exhibited. Mr. R. S. Ferguson laid before the society a report on the archæology of Cumberland. In this report perhaps the most interesting circumstance was the rediscovery of a Roman inscribed stone, found at Bowness on Solway in 1790, but which had since been lost sight of. Dr. Bruce was unable to find it, and omitted it in his "Lapidarium." Mr. Ferguson was fortunate enough to get a clue to it, and ultimately identified it. It now exhibits no trace of what forms the sixth line in Hutchinson's "Cumberland," vol. ii., p. 486, where the original discovery was recorded and the inscription itself egregiously misread. Mr. Ferguson doubted whether it had ever existed. It also appeared that the site of the Roman camp, which Hutchinson (ii. 346) states to have existed at Mowbray on the Solway, has recently been ascertained and identified. Its foundations have been excavated and laid bare in a field near Beckfoot, three miles from Mowbray, and close to Newtown. Mr. Ferguson exhibited fragments of a pewter chalice and paten, found during some alterations at Kirkoswald Church; also a MS in Amharic characters, brought from Magdala during the Abyssinian war.

ROYAL SOCIETY OF LITERATURE.

NOV. 26TH.—C. Clark, Esq., in the chair. Mr. C. F. Keary read a paper "On some Aspects of Zeus and Apollo Worship." The aspects in which these two divinities were specially regarded were as nature gods, and in a worship belonging rather to the prehistoric than to the historic ages of Greek life. The individuality of any god sprang, the writer maintained, not from the exercise of fancy, such as might give their characters to the personages of a drama, but from genuine experience. This experience was of the forces or the appearances of nature, with which are originally identified the divinities of any polytheism. The change from pure phenomenon worship to anthropomorphism first began by the transfer of power from a fixed phenomenon to one which was more arbitrary. The writer then proceeded to examine the various modifications which had taken place in the characters of Zeus and Apollo before they appeared in the guise in which they were known to historic Greece.

LINNEAN SOCIETY.

NOV. 20TH.—Prof. Allman, President, in the chair. Messrs. W. Jones and W. Wickham were elected Fellows. Sir J. D. Hooker exhibited a specimen of cedar from Cyprus, to which, from the shortness of the leaves and smallness of the female cones, the name *Cedrus Libani*, var. *brevifolia*, is applicable. In a paper accompanying the exhibition Dr. Hooker mentioned that the knowledge of this variety of cedar of Lebanon was due to Sir S. Baker, from whom a letter was read. In comparison with the above Prof. Allman laid on the table examples of cone-bearing *Cedrus deodara*, grown by Mrs. C. St. Clair at Parkstone, Dorset. Mr. E. M. Holmes exhibited and made remarks on a series of rare British lichens, hepaticæ, and freshwater algæ. He also showed the leaves, flowers, and portion of the trunk of the tree *Andira araroba*, yielding the so-called Goa powder. This vegetable secretion appears to destroy the woody tissue and ultimately itself to become deposited and fill the cavities of the heart wood Only recently it has been found that the tree belongs to Bahia, is sent to Lisbon, and thence exported to the Portuguese colonies of the East, whence its name Goa. Mr. Christy showed a bottle of chrysophanic acid, the product of the tree above mentioned; and he pointed to two aboriginal Australian skulls with occipital thickening, supposed to be induced by the blows of the natives knobkerries. A paper, "Contribution to our Knowledge of the Embryo Sac of Phanerogams," was read by Mr. M. Ward. He delineates the growth and development of the parts in question in *Butomus umbellatus*, *Alisma plantago*, and several other forms as studied in microscopic sections. The accounts given by and the views of Strasburger, Vesque, and Warming are compared and reviewed. The author states that the ovule out of its cell growth has one cell group which leads in growth, and, fulfilling a special purpose, becomes the embryo sac. Further feeble division of this produces a watery cell with two nuclei. Each nucleus again produces four nuclei, and one from the top group moves towards the middle sap-cavity. Each group of four cells is a prothallus and the cell producing this a macrospora. The two most successful macrospores behave similarly to those of some vascular cryptogams, and finally germinate, producing a ruddy prothallus of four naked nuclei. The egg cell is an oosphere. The extinct land tortoises of Mauritius and Rodriguez formed the subject of a paper by Mr. Alf. Haddon. An examination of a large series of bones obtained by Mr. E. Newton and deposited in the Cambridge Museum corroborates the Mauritian species *Testudo triserrata* and *T. inepta*, described by Dr. Gunther, but it adds no fresh example of the unsatisfactory species *T. leptocnemus*. That named *T. Vosmæri* is alone distinguishable from Rodriguez. Many examples show great tendency to variation in ankylosis of coracoid with the shoulder girdle. A second zoological contribution, "On Greenland Crustacea collected by Mr. Whymper," by Mr. E. J. Miers, was read in abstract.

DEC. 4TH.—Prof. Allman in the chair. Messrs. S. Wright, G. M. Thomson, J. G. Otto Tepper, H. B. Spotton, J. Cameron, Major Collett, and Sir S. Wilson were elected Fellows. Mr. Carruthers exhibited a bottle of Pteropods (*Spirialis retroversus*), obtained in abundance by Dr. J. Grieve in the Gareloch, Ross-shire, July, 1879. The latter states they swam rapidly to the surface, rising with a perpendicular fluttering motion, and having reached the top they raised their wing-like appendages above their heads, and, thus upholding them motionless, would then drop quietly to the bottom. Dr. M. Masters gave a communication "On certain Relations between the Morphology and the Functions in the Leaves of Conifers." Quoting the labours of Bertrand, M'Nab, and others, he proceeded to show that the leaves of the silver firs (Abies) are endowed with a power of motion, in virtue of which they are raised or depressed; on the contrary, the leaves of the spruce firs (Picea) are comparatively motionless. In the former there is a well-marked layer of "palisade cells," which are absent in the leaves of the latter. The author thus correlates these differences with varying degrees of functional activity and with adaptations manifested to secure to each leaf a favourable exposure to light, &c. Allusion was also made to the rotation of the "leader-shoots" of many conifers during the season of active growth. Prof P. M. Duncan read a paper "On a Synthetic Type of Ophiurid. This specimen was dredged by Dr. Wallich, Bulldog expedition, 1860, from a depth of 228 fathoms, off East Greenland. In shape and dental characters it approaches Amphiura; its spinules and arm hooks are those of Ophiothrix; and as regards accessory plates they resemble those of Ophiolepis. This remarkable Brittle-Star, named by the author *Polyopholis echinata*, well exemplifies the difficulty of asserting nearest affinities, when ambiguously it possesses characters of several groups; that provisionally assigned it is among the family Amphiuridæ. Prof. Duncan points out that such a form, although rare, nevertheless destroys the rigid lines of demarcation in the grouping employed by some authors Mr. C. B. Clarke followed by a paper "On Indian Begonias." This is supplementary to the author's account of the group in Sir J. D Hooker's "Flora of British India." It treats of the classification of the whole genus (*i.e.* order) except Hillebrandtia and Begoniella, and it is maintained that it (the group) can be naturally divided into the six subgenera employed in the "Flora of British India." The author discards the differences in the stamens and styles for sub-generic characters, and employs exclusively the structure and dehiscence of the fruit.

INSTITUTION OF CIVIL ENGINEERS.

DEC. 2ND.—Mr. Bateman, President, in the chair. Fifty-four candidates were balloted for and duly elected, viz., Messrs. A. P. de M. Barretto, P. M. Barnett, J. R. Bell, G. R. Clark, C. Fouracres, T. Hamilton, J. Hindle, H. W. Hudson, J. Kraft, H. C. Mais, R. Riddell, W. Scott, and W. H. Spalding, as members; Messrs. E. H. Allies, R. J. Brough, J. S. Brown, Stud. Inst. C E., R. F. Bullen, G. Channer, W B. Dawson, M.A., Stud. Inst. C.E., J. Dickson, jun, Stud. Inst. C.E., B. Fitch, S. S Grant, H. Hawes, H. E. H. Haynes, B. D. Healey, G. F H. Heenan, J. H. Home, J C. Johnston, E. C. Jones, F. E. Linging, D. Macfarlane, Stud. Inst. C E, T. May, R. L. Mestayer, W. H. Morrow, J. W Parry, Stud. Inst. C.E., J. Paterson, J. Pousford, J. Price, jun, Stud. Inst. C.E., A. C. C. Rogers, F. Simpson, Stud Inst. C.E., J. G. Single, A. Singleton, T. Smith, A. Sulivan, Stud. Inst. C.E., F. H. Trevithick, C Vincent, Stud. Inst. C.E., R. Walker, C. P. Whitcombe, and R. A. Wilkinson, as associate members; and Capt R. R. E. Brookman, R.E, Messrs A. E. Guest, H. G. Kunhardt, Lieut. R.E, A. C. Lucas, and Lieut.-Col. Newmarch, R.E., as associates. At the meeting a paper was read by Mr. W. Carson, "On the Passenger Steamers of the Thames, Mersey, and Clyde" (a report of which will be found in another column).

QUEKETT MICROSCOPICAL.

OCT. 24TH.—Dr. T. S. Cobbold, President, in the chair. Two new members were elected. A paper was read by Mr. A. Martinelli "On the Germination of a Seed." A discussion ensued, in which the President, Dr. Fischer, and Mr. J. T. Powell took part.

NOV. 28TH.—Dr. T. S. Cobbold, President, in the chair. Seven new members were elected. A short paper, "On a Method of Dry Mounting," by Prof. H. Smith, was read by the secretary. A paper by the President, "On the Fertilisation of certain Flowering Plants," was read, and gave rise to a discussion.

ROYAL INSTITUTION.

DEC. 1ST.—The Duke of Northumberland, President, in the chair Miss H. M. Adair, Major E. S. Gordon, Messrs. E. G. Amphlett, H. Fearnside, and T H. Sanderson, were elected members.

SOCIETY OF ENGINEERS.

DEC 1ST.—Mr. R P. Spice, President, in the chair. A paper was read by Mr. H. Robinson "On Sewage Disposal"

SOCIETY OF BIBLICAL ARCHÆOLOGY.

DEC 2ND.—Dr. S. Birch, President, in the chair. The Rev. A. Lowy read a communication in two parts I "On the Samaritans in Talmudical Writings," and II. "An Account given by a Samaritan, in A.D 1713, on the Ancient Copy of the Pentateuch at Nablus."

ARCHÆOLOGICAL INSTITUTE.

DEC 4TH.—The Rev. J. F. Russell in the chair. Mr. R. S. Ferguson sent a paper on the supposed sword of Sir Hugh de Morville, in the possession of Sir Wilfrid Lawson at Brayton Hall, Cumberland. The author showed that the story of the sword with which Sir Hugh de Morville kept guard in the transept of Canterbury Cathedral during the murder of Thomas à Becket, on December 29th, 1170 (o s.), was connected with a gross error in the early history of Cumberland, originated in the "Chronicon Cambriæ," and amplified in Denton's MS. "History of Cumberland," written in the time of Elizabeth. Mr. H. Hinde has proved that there were several Hughs in the Morville family, and that the Hugh lord of the barony of Burgh was not the Hugh of Canterbury notoriety, for this latter Hugh was lord of Westmoreland and Knaresborough. Denton says that "the sword that killed Thomas à Becket was at Ishall in my father's time, and since remaineth with the house of Arundel." But Denton libelled the sword as the "Chronicon libelled its owner. The story seems to have its origin in a great sword sculptured on a monumental slab in Aikton Churchyard, Cumberland, said to be the tomb of Sir Hugh de Morville. One after another historians and handbook makers have added to or further mystified the matter But it was reserved for one Thomas Carlile, a carver of Carlisle, to make a statue as large as life of Sir Hugh de Morville for the late Sir Wilfrid Lawson in 1801. This he set up at Brayton House, and in the hand of the figure he placed "the very sword" with which the knight "assisted in delivering the country from Thomas à Becket." After this statement by Carlile's biographer, the meeting was not surprised to see a basket-hilted Scotch broadsword, probably as late as 1745, bearing on each side of the blade the following distich, "Gott bewahre die auf recte Schotten," which had been sent for exhibition by Sir Wilfrid Lawson. This sword was probably obtained by Carlile from Carlisle Cathedral, where some of the Highlanders were imprisoned in 1745. A sword which was long said to be the very sword of Sir Hugh de Morville has now vanished from the cathedral. Mr. J. D. Grant sent a collection of vessels of pottery from burying places in the Tinnevelli district of the Madras Presidency, and some notes upon them. The unsystematic manner in which these interments were made was remarkable, but the most usual plan appears to have been to pack the bones, which must have been previously denuded of flesh and integuments, in earthen jars, about 3 ft. 6 in. high, and bury them just below the surface. No stone implements were found buried, but some of the jars contained smaller vessels, such as those exhibited. Mr. G. T. Clark sent some observations on Tonbridge Castle, *à propos* of the proposal to convert its area into building sites. The Rev J. M. Gatrill read a paper on a recent discovery at Greenhithe, and exhibited a human skull and pieces of pottery that had been found. Mr. W. J. Bernhard Smith exhibited a string of beads and bugles of rock crystal, onyx, carnelian, lapis lazuli, &c, and some copper coins, early thirteenth century, all found in the bed of a water-course in Oude The resemblance of the beads to Anglo-Saxon examples was remarkable. Mr H. Vaughan sent some fine German and French keys for exhibition, and an Italian miniature of Peter Martyr, early sixteenth century. Mr. R. S. Ferguson sent a ring dial, or *viatorium*, found in a bog in Dumfriesshire The chairman exhibited some examples of stained glass, sixteenth century.

FOLK-LORE SOCIETY

DEC. 9TH—Mr. W. R. S. Ralston in the chair. Mr. Coote read a paper "On Catskin—the English and Irish Peau d'Ane." The readers of "The Vicar of Wakefield" are familiar with Goldsmith's reference therein to a folk-tale which he calls "The Adventures of Catskin" This tale, which has been long lost, Mr. Coote reproduced to the English public, and identified with *peau d'ane* and an analogous story which is spread through Europe, Russia and Albania included. Its origin was traced to a myth in the Rig-Veda. In the discussion which followed, Mr Ralston, though not agreeing with Mr Coote's theory as to the origin of the story, pointed out that the author had discovered the English and Irish version which Dr. R. Kohler had set the whole staff of the British Museum to work upon, but without success. Mr. D. Nutt and the Rev. J. Long also took part in the discussion.

THE SUPPOSED ARTIFICIAL PRODUCTION OF THE DIAMOND.

ON this interesting subject, which is once again engaging public attention, the following communication in the *Times*, by Mr. Nevil Story Maskelyne, of the Mineral Department of the British Museum, is worthy of careful consideration:—

I should be obliged if you would accord me space in the *Times* in order that I may answer a great number of letters and applications which have pursued me during the past few days on a subject of some little public interest, that subject being the asserted formation of diamonds by a gentleman at Glasgow.

Some ten years ago I had heard nothing whatever of the claim of Mr. Mactear, of the St. Rollox Works, Glasgow, to the artificial production of the diamond. My name, however, was already in several newspapers as that of a person in whose hands the asserted diamonds had been placed for a decision as to their true nature Ultimately, a small watch-glass, with a few microscopic crystalline particles, came into my hands for this purpose from Mr. Warington Smyth, and subsequently a supply came to me direct from Mr. Mactear. I shall proceed to state the results I have obtained from the examination of these.

Out of the first supply I selected by far the largest particle, one about 1-50th of an inch in length, and it may be that I wasted some time in experimenting on this particle as it might not have been an authentic example of the "manufactured diamond," since it differed in some respects from the specimens I have since received from Mr. Mactear.

Now, firstly, the diamond excels all substances in hardness. Secondly, its crystals belong to the cubic system, and should not, therefore, present the property of doubly refracting light. Frequently, however, from the influence of strain within the crystal, caused by enclosed gas-bubbles or other causes, diamonds are not entirely without action on a ray of polarised light sent through them. Finally, the diamond is pure carbon, and, as such, burns away when heated to a sufficiently high temperature in the air, and more vividly so burns or glows away when heated in oxygen gas.

The specimens I had to experiment upon were too light to possess appreciable weight, too small to see unless by very good eyesight or with a lens, yet were, nevertheless, sufficiently large to answer the three questions suggested by the above properties

A few grains of the dust, for such the substance must be termed, was placed between a plate of topaz—a cleavage face, with its fine natural polish—and a polished surface of sapphire, and the two surfaces were carefully "worked" over each other, with a view to the production of lines of abrasion from the particles between them. There was no abrasion. Ultimately the particles became bruised into a powder, but without scratching even the topaz. They are not diamond.

Secondly, some particles, more crystalline in appearance than the rest, were mounted on a glass microscope slide, and examined in the microscope with polarised light They acted each and all powerfully in the manner of a birefringent crystal. It seemed even in one or two of them that when they lay on their broadest surface (it can scarcely be called a "crystal face") a principal section of the section of the crystal was just slightly inclined to a flattish side of it in a manner that suggested its not being a crystal of either of the orthosymmetrical systems Be that as it may, it is not a diamond.

Finally, I took two of these microscopic particles and exposed them to the intense heat of a table blowpipe on a bit of platinum foil. They resisted this attempt to burn them. Then, for comparison, they were placed in contact with two little particles of diamond-dust exceeding them in size, and the experiment was repeated. The result was that the diamond particles glowed and disappeared, while the little particles from Glasgow were as obstinate and unacted on as before. I had previously treated the specimen I have alluded to as the first on which I experimented by making a similar attempt in a hard-glass tube in a stream of oxygen, and the result was the same. Hence I conclude that the substance supposed to be artificially formed diamond is not diamond and is not carbon; and I feel as confident in the results thus obtained from a few infinitesimal particles that can hardly be measured, and could only be weighed by an assay balance of the most refined delicacy, as if the experiments had been performed on crystals of appreciable size.

Not content with merely proving what these crystalline particles are not, I made an experiment to determine something about what they are.

Heated on platinum foil several times with ammonium fluoride they became visibly more minute, and a slight reddish-white incrustation was seen on the foil. At the suggestion of Dr. Flight, assistant in this department, a master in the craft of the chemical analyst, these little particles were left for the night in hydrofluoric acid in a platinum capsule. This morning they have disappeared, having become dissolved in the acid, and on evaporation there is seen a slight white incrustation, on the capsule, of the residuary fluoride. I have, therefore, no hesitation in declaring Mr. Mactear's "diamonds," not only not to be diamonds at all, but to consist of some crystallised silicate, possibly one resembling an augite, though it would be very rash to assert anything beyond the fact that they consist of a compound of silica, possibly of more than one such compound

The problem of the permutation of carbon, from its ordinary opaque black condition into that in which it occurs in nature as the limpid crystal of diamond, is still unsolved. That it will be solved no scientific mind can doubt, though the conditions necessary may prove to be very difficult to fulfil. It is possible that carbon, like metallic arsenic, passes directly into the condition of vapour from that of a solid, and that the condition for its sublimation in the form of crystals, or its cooling into crystal-diamond from the liquid state, is one involving a combination of high temperature and high pressure present in the depths of the earth's crust, but very difficult to establish in a laboratory experiment

PASSENGER STEAMERS OF THE THAMES, THE MERSEY, AND THE CLYDE.

By W. Carson, M. Inst. C.E.

The paper on this subject, read at a recent meeting of the Institute of Civil Engineers, is developed by the official abridgment as follows —It was stated that the bulk of the traffic by light-draught passenger steamers in Great Britain was carried on these rivers, and that each port had adopted a practice independent of the experience of the others. On the Thames above-bridge, small vessels of light draught, moderate speed, great steerage power, and well under engine control, were used, but at the expense of strength of build. On the Thames below-bridge, high speed and large carrying power led to the employment of long vessels. On this river all the lines competed with railway and omnibus routes, necessitating lower fares and inferior passenger accommodation, and therein contrasting unfavourably with the Mersey and the Clyde. At Liverpool, the service was carried on at the mouth of an open estuary, the bulk of the passengers crossing the stream, a distance of less than 2,000 yards, and the vessels were of heavier build, short length in proportion to beam, and great steerage power. On the Clyde the traffic somewhat resembled that of the lower Thames, but the river was more sluggish and there was less competition by land Under these circumstances the vessels were superior in passenger accommodation, in power, and in the steering arrangements.

Some of the latest examples of the vessels employed in these three river-services were then described, including an above-bridge Thames boat, built of iron by Messrs. Samuda and Co., and a Woolwich boat, built of iron by Messrs. Westwood and Baillie. The chief peculiarity of the ferry boats of the Mersey was that they had the bow and stern alike, with a rudder at each end, one such vessel, the "Claughton," being selected for illustration; also the "Heatherbell" and the "Waterlily," different types of vessels used in the more exposed parts of the Mersey. Of the highest class of Clyde passenger steamers, a description was given of the "Lord of the Isles," an iron vessel built in 1877, by Messrs. D. and W. Henderson and Co. The screw passenger boats built by the engineers of the Clyde trustees, and the steamers for the cart and horse traffic, designed by Messrs. W. Simons and Co., were also noticed.

It was next observed that as river craft, engaged within smooth or partially smooth water limits, were not subjected to the strains arising from heavy loads and the rough treatment of sea-going vessels, their proportions and scantlings need not conform to those of the latter, which were designed to carry up to half as much again as their own weight. The severest strains to river craft probably arose from their engine power, from the concentration of heavy machinery in the centres of the vessels, and from the weights of the fine ends which did not provide displacement to carry themselves. The strains, therefore, from load and propelling power, were of so moderate a character that they could be well taken up without such an increase in the total weight as would unfit the vessels for their special work, which particularly demanded speed and a light immersion. In considering their ultimate strength, it was pointed out that, from the long and stormy voyages which many river steamers had performed—work so far beyond that for which they had been designed—their perfect sea-worthiness for their proper duty was beyond question. From collision alone need danger be apprehended, and its results anticipated in their design. The precautions against this latter danger were stated to be: (1) effective division by bulkheads; (2) defence, especially for cross-river traffic, by overhanging sponsons; (3) perfect engine and steerage control. The steering ought to be performed by steam or water power in the larger vessels, with telegraphic communication in every case between the bridge and the engine-room. It was further suggested that an effective bulkhead division ought to be compulsory, and it would not be unreasonable to require that all seats should be fitted loose, and made bouyant, on vessels which carried so great an amount of human life in proportion to their tonnage as to render any adequate provision of boats impossible.

In conclusion, it was remarked that; in the absence of skilful commanders, the precautions of thoughtful construction were useless, and immunity from the most pressing risk—collision—must not be expected from the shipbuilder or the engineer, who could only hope to limit the effects of the injuries caused by such accidents.

LITERARY ANNOUNCEMENTS.

Two gift book stories for the family are announced by Messrs. W. B. Whittingham and Co.; "Jemima, a Tale of English Home Life," by Adelaide; and a re-issue of "Won by Waiting," a tale opening with the siege of Paris, by Edna Lyall.

"The Southern Cross" is the title of a volume of important information on Australia, by Mr. H. Cornish, of Madras; it is announced by Messrs. W. B. Whittingham and Co.

Messrs. W. B. Whittingham and Co. have in the press "Woman's Fortitude," a tale of the Cawnpore mutiny, by Lieut.-Col. Edward Money.

The Rev. Samuel Murch has compiled a handbook for teachers and ministers, entitled "The Teachers' Parables," an Exposition of the Parables of Our Lord. It is included in Messrs. W. B. Whittingham and Co.'s list of new publications.

The ancients regarded the ocean as the cradle of life, and yet they only knew it from the beach; they had no means to sound its depths. Had they, it would have been found that the occupants of the ocean do not inhabit indifferently the depths. Some animals, as can be seen by the reflux of the tide, live about one yard below the mean level of the sea, others at three or six. The same remarks apply to the vegetation. During a neap tide quite new varieties of beings are revealed. Many molluscs that live under the tropics at small depths, extend to the coast of Norway and Newfoundland, in the profoundness of the Atlantic—at the entrance of the Arctic Ocean. In the Lake of Geneva, which is very profound, quite new species of animals have been dredged, some without eyes.

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Upholstery.—H. Carey, E. F. Redfern (com.)

Urinals.—F. Wirth (com.)

Valves, Taps, Stop Cocks, Plugs; Regulating the Flow and Pressure of Fluids.—A. M. Clark (com.), W. E. Gedge (com.), W. C. Edwards and M. Stobbs, W. R. Lake (com.), G. Grant.

Velocipedes, Bicycles, &c.—G. W. Perris, J. Bonner, T. Warwick.

Ventilation: Supplying and Purifying Air for Buildings Mines, Ships, Carriages, &c.—G. L. Scott and S. Hallam, T. Jones.

Voting, &c.—H. C. Simons.

Washing, Cleansing, and Wringing Fabrics, Yarns, and Materials.—C. Griffiths (com.)

Waterproofing, &c.—R. Condy.

Water-Closets, &c.—G. Grant.

Watering and Irrigating, &c.—E. H. Bayley.

Water-power Engines, &c.—P. Jensen (com.), J. P. Lambert and L. E. Iverneau, J. L. Corbett and W. Lochhead.

Wax.—W R. Lake (com.)

Wearing Apparel, &c.—W. H. Chase (com.)

Weaving, Braiding, Plaiting, Preparing for Weaving.—R Meddows, G. Ambler, R. S. E. and R. Collinge, W. H. Holmes, G. Keighley.

Windowblinds, &c.—J. Rettie.

Windows and Sashes.—J. Totton, J. Rettie.

Wire, Wire Working, &c.—J. and H. Law.

Zinc.—R. A. Fisher, R. A. Fisher.

*** *The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.*

Correspondence.

LUMINOUS PAINTS.

TO THE EDITOR OF THE SCIENTIFIC AND LITERARY REVIEW.

Sir,—I am making experiments at the present moment directed to the manufacture of luminous paints, with a view to determining the possible amount of light to be obtained from such phosphorescent compounds, to be used as a means of illumination in the place of other artificial illuminants. When I have completed my experiments I shall be happy to describe them in the Scientific Review.

Frank Scott

London, E., Jan. 29, 1880.

Reviews.

HON. H. CAVENDISH.

"The Electrical Researches of the Honourable Henry Cavendish, F.R.S." Written between 1771 and 1781; edited from the original manuscripts, in the possession of the Duke of Devonshire, K.G., by J. CLERK MAXWELL, F.R.S. Cambridge: University Press.

THE Hon. H. Cavendish was one of those singular beings occasionally met with in this world of ours; his peculiarities appear to have been such as make him stand out in bold contrast to nearly all others workers in science; for, as our able contemporary, the *Journal of Science*, remarks:—Every discoverer, now-a-days (we would apply the statement that follows to most discoverers of former days), whether great or small, as soon as he finds his light—whether it be a six-thousand-candle electric lamp or only a halfpenny dip—immediately hastens to place it on the top of the tallest hill he can find, so that it may shine forth literally *urbi et orbi*. Many lights, it is true, give forth only a feeble glimmer; but it is surely better that we should be at times overburdened with crude observations of possibly valueless facts, than that a single particle of truth should be concealed, or its publication delayed even for a day more than is absolutely necessary.

An important discovery in any branch of physical science is now made public with a rapidity that has never before been equalled, and the paper, article, or even telegram containing its history is published and re-published, discussed and criticised, in every civilised language The observations described are repeated and tested in half a hundred laboratories, and the slightest incorrectness or mis-statement is pounced upon with the utmost eagerness, and published with the same universality as the original researches themselves. The numerous facilities which we possess for spreading and sifting scientific observations are bearing fruit every day, and the scientific press—although its office is to collect and distribute facts rather than to criticise them—has become as great a power in its own particular sphere as its elder sister, the political press, has in the hands of our political fellow-workers.

As regards Cavendish, who stands so eminent in regard to physics and chemistry, he was the eldest son of Lord Charles Cavendish, third son of William, second Duke of Devonshire. And it appears that during his father's lifetime he was kept in rather narrow circumstances, being allowed an annuity of £500 only, while his apartments were a set of stables, fitted up for his accommodation. It was during this period that he acquired those habits of economy and those singular oddities of character which he exhibited ever after in so striking a manner.

The great peculiarity of Cavendish seems to have been his thoroughly undemonstrative character. As to this the Editor states:—

"Cavendish cared more for investigation than for publication. He would undertake the most laborious researches in order to clear up a difficulty which no one but himself could appreciate, or was even aware of, and we cannot doubt that the result of his inquiries, when successful, gave him a certain degree of satisfaction. But it did not excite in him that desire to communicate the discovery to others which, in the case of ordinary men of science, generally ensures the publication of their results. How completely these researches of Cavendish remained unknown to other men of science, is [illegible] by the external history of electri[illegible] [illegible] "researches" which Prof. Maxwell has disinterred, we may quote the the following:—

"He shows that when two charged conductors are connected by a wire they must be electrified in the same degree, and he devotes the greater part of his experimental work to the comparison of the charges of the two bodies when equally electrified. He ascertained by a well-arranged series of experiments the ratios of the charges of a great number of bodies to that of a sphere 12·1 inches in diameter, and as he had already proved that the charges of similar bodies are in the ratio of their linear dimensions, he expressed the charge of any given body in terms of the diameter of the sphere, which, when equally electrified, would have an equal charge. so that when in his private journals he speaks of the charge of a body as being so many 'globular inches,' or, more briefly, so many 'inches of electricity,' he means that the capacity of the body is equal to that of a sphere whose diameter is that number of inches."

"In his early experiments he seems to have endeavoured to obtain a number of conductors as different as possible in form, of which the capacities should be nearly equal Thus we find him comparing a pasteboard circle of 19·4 inches in diameter with his globe of 12·1 inches in diameter, but, finding the charge of the circle greater than that of the globe, he ever after uses a circle of tin plate, 18·5 inches in diameter, the capacity of which he found more nearly equal to that of the globe."

"He also provided himself with a set of glass plates coated with circles of tin-foil on both sides These plates formed three sets of three of equal capacity, the capacities of the three sets being as 1, 3, and 9, with a tenth coated plate whose capacity was as 27. Besides these he had 'double' plates of very small capacity, made of two plates of glass stuck together, and also other plates of wax and rosin, the inductive capacity of these substances being, as he already found, less than that of glass; and jars of larger capacity, ranging up to his great battery of forty-nine jars, whose capacity was 321,000 'inches of electricity.' In estimating the capacity of his battery he used the method of repeated touching with a body of small capacity."

"We have next to consider the steps by which he established the accuracy of his theory."

"The first experiment is that of the globe within two hemispheres, from which he proves that the electric force varies inversely as the square of the distance, or at least cannot differ from that ratio by more than a fiftieth part. The degree of accuracy of all the experiments was limited by the sensitiveness of the pith ball electrometer which he used."

"The third experiment shows that in comparing the charges of bodies, the place where the connecting wire touches the body, and the form of the connecting wire itself, are matters of indifference."

"The fourth experiment shows that the charges of bodies of the same shape and size, but of different substances, are equal."

". . . . . The observed charges of coated plates were found to be always several times greater than the charges computed from their thickness and the area of their coatings, the ratio of the observed change to the computed charge being for plate glass about 8 2, for crown glass about 8·5, for shellac about 4·47, and for beeswax about 3·5. Thus Cavendish not only anticipated Faraday's discovery of the specific inductive capacity of different substances, but measured its numerical value in several substances.

"The accuracy which Cavendish attained in the discrimination of the intensity of shocks is truly marvellous, whether we judge by the consistency of his results with each other, or whether we compare them with the latest results obtained with the aid of the galvanometer, and with all the precautions which experience has shown to be necessary in measuring the resistance of electrolytes."

These quotations will afford the reader a good idea of the contents of this work, the publication of which was quickly followed by the decease of its lamented editor. It is well worthy of perusal by every man of science.

REVIEWS POSTPONED.

REVIEWS of the following works, which we deem worthy of favourable notice, we are compelled by pressure of other matter to postpone, viz., "Hot Air *versus* Hot Water Baths for the Working Classes," by Richard Metcalfe; "William Daniels, Artist," by William Tirebuck; "Notes of a Journey to the Auriferous Quartz Regions of Southern India, with Facts Relating Thereto," by A. Hay Anderson (Blackwoods). Several other works were received too late for review in our present issue.

THE ELECTRIC LIGHT IN THE CITY.

THE premises of Messrs. Samuel Brothers, merchant tailors, Sydenham House, 65, and 67, Ludgate-hill, in the City of London, have been fitted up with the electric light, and the inaugration of the lighting took place on the evening of the January 14th, in the presence of a large number of gentlemen interested in the question of electric lighting, representatives of the press, &c.

The premises are lighted by means of 13 electric lamps of the Jablochkoff system, and are distributed as follows:—One in each of the two windows on each side of the principal entrance in Ludgate-hill; two in the front of the ground floor; two in the back of the ground floor; one in the counting-house; one over the landing of the large staircase leading to the upper floor; three in the juvenile and ladies' department on the first floor; two in the gentlemen's bespoke department on the first floor.

The lamps are all suspended from the ceiling, at a distance of about eight feet from the floor, and by means of harp pendants, through which the conducting wires are conveyed to the candles. They are made to contain four Jablochkoff candles, and as each candle lasts two hours a continuous light for eight hours is therefore provided. The lamps can easily be replenished when the last candle is burning, so that, practically speaking, the light can be made to be continuous for any length of time. The globes are of the opalescent description, and twenty inches in diameter.

The currents of electricity are produced by a battery of Gramme Patent Dynamo Electric Machines of the twenty light size; the battery being composed, as is well known now, of a small Gramme continuous current distributing machine. The large machine is divided into four circuits, capable of maintaining five lights each. In the existing arrangement three circuits only of the distributing machine are utilised, two maintaining four lights each, and one maintaining five lights. An additional lamp was temporarily added to that number, and was kept burning in the engine-room, which it lighted admirably.

The lights are arranged so as to be all switched from a switch board placed at one of the cashier's desks on the ground floor. This arrangement is an important feature, and the switching was shown in operation. The motive power for working the electric machines is obtained from a twelve horse-power "Otto" gas engine, made by Messrs. Crossley Brothers, of Queen Victoria-street, London.

This gas engine, like the electric light itself, is one of the most remarkable and important inventions of the nineteenth century.

It is made in sizes, with a single cylinder from one-half to forty indicated horse-power. By using a double cylinder the power can be increased to one-hundred horse-power. There being no boiler, all risk of a boiler explosion is removed, which allows this engine to be used where steam is inadmissible. As there is no risk of fire, the rate of insurance is not affected by the presence of an "Otto" gas engine. There are no coals to get in or store, or ashes to remove. There is no smoke, consequently the neighbourhood is not disfigured by a high chimney with its cloud of dirty smoke, and the owner is not annoyed by visits of the inspector of nuisances. The "Otto" gas engine is always ready to start at a moment's notice on lighting a jet of gas and turning the fly wheel, there being no delay till steam is raised as in the case of a special steam engine. By dispensing with the boiler, the boiler attendant's wages are saved; in fact, this gas engine offers all the advantages of a steam engine without any of the accompanying disadvantages of having a steam boiler on the premises. Economically speaking, the gas engine is cheaper to work than a steam engine, especially when the work is intermittent; it is, therefore, no matter of surprise that the "Otto" gas engine is rapidly replacing steam engines in all places where a supply of gas is available. It is within the mark to say that this engine is taking the place of steam at the rate of twenty-five engines a week, a fact that should go a long way to reassure holders of gas stock.

The Gramme Machine is driven directly by means of suitable pulleys fixed on the shaft of the engine, the small one, or excitor, running at a speed of 620 revolutions, and the large one, or distributor, at a speed of 688 revolutions per minute. They are together with the gas engine erected in a room situated in the basement at the back of the building.

The whole mechanical and electric plant which have been fixed and fitted up, under the immediate supervision of Mr. J. A. Berly, C.E., the engineer to the Société Générale d'Electricité, are erected in a most substantial manner.

From an experiment made by Mr. Berly and Mr. Wilson, C.E., the London representative of the firm of Messrs. Brossley Brothers, a number of lights equal to twenty have been maintained by the gas engine, and there is no doubt that a larger number could be maintained after the plant has been in operation during a certain period, as the stiffness with which all new machines work will gradually disappear and the producing qualities of the Gramme machines will gradually improve.

This is the first time, in this country as well as in France, that a large number of Jablochkoff lights have been worked from a gas engine, and Messrs. Samuel Brothers deserve great credit for the enterprising spirit which they have shown, in adopting for their splendid establishment this mode of illumination which is now steadily making its way ahead, and will, in all probability, be generally adopted within a very limited period.

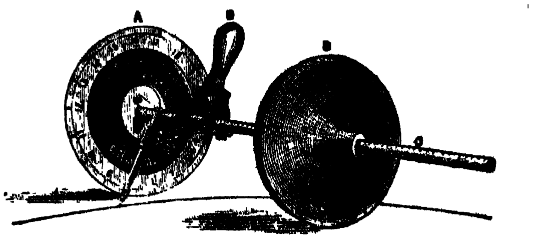
On visiting the bespoke and ladies' department of Messrs. Samuel Brothers premises, we could at once appreciate the immense advantage that the purchasing public would derive from the general adoption of the electric light.

On examination of some ladies' costume cloths, gentleman's suitings, &c., we found that the most delicate colourings and tints were as distinctly discernible as if viewed by daylight.

Amongst the persons present at the inauguration of the lighting of Messrs. Samuel Brothers premises were, Mr. J. Gaudet, the managing director of the Société Générale in England, &c.

THE GRAPHARC.

This instrument, the invention of Mr. Thomas P. Worthington, architect, of Blackpool, is designed to describe circles or arcs of circles of large radii in limited workshops or other places where the length of radius cannot be got. It will also describe arcs of small radii, say from four feet upwards, more expeditiously than by the usual method.



There are two wheels, axis or spindle, distinctly graduated for feet and inches radius and a propelling handle with marker or pencil.,

The larger wheel is marked A. the other B, the spindle C, and handle with marker D.

It will at once be seen that the two wheels form the frustrum of a cone whose unseen apex is (when this frustrum is rolled) the centre of the circle or arc described by the larger wheel. It will also be seen that by placing the wheels nearer together the apex or centre is also nearer, and by putting them further apart the centre is further away

The principle of the invention is thus explained. but to bring the principle to be of use it was necessary that the wheels should be in known ratio one to the other. and that the axis should be graduated to suit, so that the draughtsman could at once set the wheels at such distance apart as would give him the curve of radius required.

The inventor found that by having the diameter of the lesser wheel exactly one proportion less than that of the larger one, and these proportions known, that the graduation of the axis per foot radius was exactly the fraction of an inch (for English measures) having the proportional number of the larger wheel as the denominator, and twelve as the numerator, thus :—

Proportion of diameters of wheels.			Graduation of axis per foot radius.
Large wheel.		Small wheel.	
2	and	1	12-2 or 6".
5	,,	4	12-5
10	,,	9	12-10
20	,,	19	12-20 of an inch.
40	,,	39	12-40 ,,
1000	,,	999	12-1000 ,,
1200	,,	1199	12-1200 ,,

and so on.

From this list of proportions and graduations, it will be at once seen that the range of radii is practically only limited by the ability to manufacture the instrument. which there is no doubt would be rather difficult in the higher proportions if the wheels were required of small size, but so long as the proportional difference is right, the wheels may be of any size desired, and this without making any difference with the graduations for these proportions.

For curves up to 50 feet radius the larger wheel need not be over 2½ inch diameter, and proportioned to 50 parts, and the lesser wheel one part less in diameter, or 49; this would require axis graduated to 12" long with graduations 12-50 of an inch apart, these representing feet radius of curve which the large wheel will run when wheels are adjusted. It is obvious that with this instrument a less radius than 10 feet could not with steadiness and certainty be described, as for this the wheels would be but 1-5th of a foot apart, but any radius could be used with this instrument between 10 feet and 50 feet.

For larger curves larger instruments would be required; for instance, take one to describe curves of from 2000 to 10,000 feet radius. The larger wheel in this would of necessity have to be of considerable size to make the proportional difference with accuracy, as the proportions would not well do less than 1000 for large wheel and 999 for lesser one, and with these proportions the axis would require to be 10 feet long. For an instrument of this range I should propose the larger wheel of near 3 feet in diameter, and with this the lesser wheel would but differ in diameter by about 1-28th of an inch.

Curves of the largest or least radius (within the range of the instrument) can be drawn with equal facility and dispatch, and with same limited space. An arrangement of the same patent is prepared for the purpose of the perspective draughtsman, for use in getting all his radial lines to either vanishing point without the long straightedge or centro-lineal.

ENGINEERING PAST AND PRESENT.

By Mr. W H. Barlow, F.R.S., President of the Institution of Civil Engineers.

The following is the official abstract of the presidential address of Mr. W. H. Barlow (who, it may be right to state, is one of the original members of the Inventors' Institute, and a member of its Council), delivered at the first ordinary meeting after the Christmas recess, held on Tuesday, the 13th of January, which will be found to afford a concise view of engineering past and present :—It stated that his professional career having commenced in 1828, the same year as that in which the institution had received its royal charter, he proposed to draw attention to the great changes and progress in engineering which had arisen since that time. Undeniably, the influences that had mainly operated on the well-being of this kingdom, and on the world at large, were the improvements in the means of communication, by the application of steam to locomotion on land and on sea, and by the utilization of some of the powers of electricity in the transmission of intelligence.

For some time previous to 1828, an improvement had been urgently demanded in the means of transport for goods and minerals. The canals were estimated, in 1836, to exceed 3,000 miles in length; but they were wholly inadequate to the wants of the commercial interest at that time. Much attention was bestowed on turnpike roads, many of the main lines having been brought to a high degree of excellence by Thomas Telford, the first president of the institution. Tramways, which existed long before canals and in considerable numbers in the mineral districts, were mostly of cast iron, and belonged to private owners, few being applied to the general purposes of commerce. There were also some railways, distinguished from tramways, as their name implied, by being formed of rails instead of tram-plates; among which was the well-known Stockton and Darlington Railway. The application of steam in locomotive engines was in an early experimental stage; and the labours of George Stephenson, in connection with the Liverpool and Manchester Railway, formed the starting point of that great railway system which had spread its network and its ramifications in many parts of the world. The system thus inaugurated in 1830 was estimated, in 1875, to have reached 160,000 miles in length, the capital invested in their construction having been 3,200 millions sterling. Since then there had been considerable extensions; and when it was remembered that China had at present no railways, that Japan was only beginning to construct them, that Africa, with a population of between 350 and 400 millions, was almost without railways, as well as a large part of South America and Central Asia, and that the British Colonies were still badly provided, it must be obvious that the railway system would continue to increase. It had been ascertained that the traffic growth on all the lines in the United Kingdom, over a period of thirty-two years, had averaged more than £100 per mile per annum. To meet the exigencies of this increase, a reconstruction of the permanent way, engines, and carriages had been necessary, as well as extensive additions to stations. While these improvements had added much to the comfort of railway travelling, a complete system of block-signalling, the employment of continuous brakes, and the interlocking of points and signals, had greatly increased the safety, notwithstanding the higher speed, and the greater number of trains. The recent most lamentable and unprecedented accident at the Tay bridge was at present the subject of a searching investigation, which it might be hoped would reveal the probable cause or causes that had contributed to such distressing results, and thus afford information of the greatest value for future guidance.

The limited number of steam vessels existing in 1828 were chiefly employed in river and coasting traffic. At that time all ships, including ships of war, were of timber. Ocean steam navigation had not been attempted, the starting point of which might be said to have been the almost simultaneous voyages of the "Sirius" and the "Great Western," in 1838. Its commercial success and the extent to which it had been carried, were owing to improvements which involved a greater range of scientific knowledge than the construction of railways, and were due to deep thought and unremitting perseverance. By improvements in the marine-engine, the consumption of fuel had been largely reduced; the screw propeller had taken the place of the paddle-wheel, by which greater advantages in propulsion had been obtained; and the substitution of iron and steel for timber in the construction of ships, combined with a better knowledge of their forms and lines (the latter owing mainly to the valuable researches of the late William Froude), had enabled vessels to be made of much greater strength and carrying capacity.

The extension of ocean navigation had rendered necessary a great increase in dock and harbour works, several of which were alluded to; but the number of wrecks that occurred annually within British waters, seemed to show that more harbours of refuge were required on the coasts of the United Kingdom, while there was evidence that the development of steam navigation was impeded by an insufficiency of harbours. This was especially observable in regard to the communication between England and France. It was satisfactory to learn that the French Government was about to improve the harbours on the coast of France, and it was hoped that this would be followed by corresponding action on the part of the English Government.

The introduction of electricity for the purposes of telegraphy, and more recently for the production of light, and lastly, for the transmission of power, was a matter of special interest, as being one in which the labours of the philosopher, and the discoveries originating in his laboratory, were made directly serviceable "for the use and convenience of man." As in many other [illegible] and new applications of science, [illegible] which the telegraph ultimately received in the hands of Sir Charles Wheatstone and Sir William Fothergill Cooke, and its use to signalling on the Blackwall Railway in 1838, had been preceded by various suggestions showing the conception of the idea. Sir Francis Ronalds made a telegraph worked by frastional electricity, of which he published an account in 1823. A much nearer approach to the needle telegraph was an experiment by the late Professor Barlow (the father of the President), who used a galvanic battery, and deflected small compass needles placed in different parts along the conducting wire. By this experiment, which was recorded in the *Edinburgh Philosophical Journal* for 1825, Professor Barlow found that considerable loss of power arose with increase of length, and he was in consequence discouraged from proceeding further than determining some of the laws on which that decrease depended, and also the relative conductivities of different sizes of brass or copper wire. The large-quantity battery that had been employed in his experiments on electro-magnetism was used without any coil, and the wires were hung to the posts without any insulation. In 1875, the total length of wire in operation was estimated at 400,000 miles. Since then the Eastern Telegraph Company had extended its lines to the Cape of Good Hope; two new cables had been laid between France and America, and large extensions and duplications of land lines had been made. There were no means of tracing the traffic growth of telegraphy; but by the introduction of the duplex system and the automatic working, together with other ingenious contrivances, the traffic must have increased in a far greater proportion than the length of wire in operation. The diminution of power, arising from increase of length in the conducting wire, had been surmounted by relays of power applied at fixed stations. By employing this ingenious expedient on the Indo-European Telegraph, Calcutta had frequently been put in direct communication with London, a distance of 7,000 miles. Another application of the telegraph, now commencing in this country, but already in considerable use in America, was the telephone, first publicly exhibited by Professor Bell at the Philadelphia Exhibition in 1876. The power of transmitting the sound of the human voice and its articulation, gave it a high scientific interest. Its value as a commercial instrument consisted in saving the time required to write, transmit, and re-write telegrams. The more recent electro-dynamic machines had placed lighting by electricity on a totally different footing to that on which it formerly stood, and left no doubt of its applicability to many important purposes. It was, in fact, already established in lighthouses, where its intensity and power were of the highest value, and there were many examples of its application in public buildings and large shops, in railway stations and open spaces, and for street lighting. Whether it could be divided, so as to become equally economical and convenient for domestic purposes, had yet to be ascertained. The distinction between the intensity of light and its illuminating power ought not to be overlooked. The intensity of a light bore the same kind of relation to its illuminating power as the specific gravity of a substance did to its weight. The latest application of electricity, namely, for the transmission of mechanical energy, was suggested by Dr. C. William Siemens, who had ascertained that, including all sources of light, 50 per cent of the original power could be realised at a distance of one mile, and that, with adequate provisions against heating, it would be no dearer to transmit electro-motive power to a greater than to a smaller distance. Sir William Armstrong had availed himself of this force for working a circular saw placed at a distance of one mile from the waterfall which supplied the floor. The deep sea sounding-line on board the telegraph ship "Faraday" was hoisted by mechanical energy thus transmitted from the engine; and Dr. Werner Siemens had succeeded in obtaining locomotive power sufficient to convey thirty persons by similar means.

By the action of the City of London, and at a later period of the Metropolitan Board of Works, the condition of the metropolis has been greatly improved. But during the last fifty years the only additional public communications made across the Thames, within the active metropolitan area, were the Hungerford Suspension Bridge, since removed and replaced by the public footway in connection with the Charing Cross Railway Bridge, and the Lambeth Bridge and the Tower Subway, the two latter constructed by Mr. Peter W. Barlow. The extensive increase of traffic in the more commercial part of the metropolis, produced such great difficulties at London Bridge, that some other road communication to the eastward of that bridge could not much longer be delayed.

The employment of gas as a means of illumination, which was in its infancy in 1828, had increased in a remarkable degree. The capital invested in gas-works, in the United Kingdom, was £40,000,000, of which about £12,000,000 represented the capital of the London Gas Companies. At the end of 1878, the length of gas mains in the metropolis was 2,500 miles, and there were about 58,000 public lamps for street lighting. In the same year the quantity of coal decarbonized was 1,715,000 tons, which produced nearly 17,500 million cubic feet of gas, besides residual products of the value of £745,000. The coal used was about four-tenths of a ton per annum per head of the population. Of the gross revenue 5 per cent was derived from street lighting, 20 per cent arose from the sale of residual products, and 75 per cent from private consumers.

The application of wrought iron in the superstructure of engineering works having been touched upon, the president remarked that the improvements effected in the manufacture of steel assumed the character of new discoveries, which were tending to revolutionise the iron industries of the world. The inventions of Sir Henry Bessemer, followed by those of Dr. C. W. Siemens, and Mr. Martin, had led to this change. Besides the advantages which steel had over iron for rails, wheel tyres, and structural purposes, there was a general gain to the community arising from the smaller quantity of coal required for its production. Thus, to make a ton of iron about six tons of coal were necessary, but to make a ton of steel three tons of coal sufficed. The production of modern steel was a subject which the president had followed from its commencement with great interest. A committee of engineers, of which he was a member, had made an extended series of experiments on steel, and the subject had been referred by the Board of Trade to Sir John Hawkshaw, Colonel Yolland, and the president. This resulted in the adoption of a co-efficient for steel of 6½ tons to the inch, that of iron being five tons; it being understood that for steel of high qualities the co-efficient should be raised by agreement, due precautions being observed in the testing. Although enough was known about steel for ordinary structural purposes, there were properties belonging to that material which greatly needed further experimental enquiry. Untempered steel was very like good iron in two of its characteristics. First, it possessed nearly the same modulus of elasticity; and, scondly, the force required to extend it to the limit of its elasticity, or the force at which an appreciable permanent set first appeared, was about one-half that required to cause rupture. The superior strength of untempered steel over that of good wrought iron was proportionate to the greater range of its elastic action: and the ratio which this greater range of elastic action bore to that of iron varied with different qualities of steel. But the strength of steel might be greatly improved by tempering in oil, a process now much in use. Experiments were wanting to determine what change, if any, arose in the specific gravity of the metal when under strain within its limit of elastic action. Within certain limits the stretching, either of iron or of steel, beyond its original elastic limit increased the strength and the range of elastic action. The process of cold rolling was an example of this effect; and steel wire, drawn cold, exhibited remarkable strength—that employed by Sir Wiliam Thomson in his deep-sea soundings having borne 149 tons to the inch. One of the most striking applications of the hydraulic press was that introduced by Sir Joseph Whitworth by which large ingots of molten metal were subjected to a pressure of six or seven tons per inch, and the ingot thus rendered perfectly solid and sound. At the same works, the hammer was dispensed with in large forgings of steel, the red-hot metal being pressed into the required form by the hydraulic press.

In the early days of the institution, the laws which governed mechanical action and forces, and the strength of materials, were very imperfectly understood. In the interval the great advances in practice had been accompanied by a marked extension in an accurate knowledge of the physical sciences. Obviously it was most essential that engineers should be acquainted with the principles which lay at the foundation of mechanical science, and with the nature and properties of the materials employed in works. It was, therefore, satisfactory to find that many colleges now had special departments for imparting instruction in applied science, and the increasing area of scientific requirements rendered it desirable that a yet wider field should be given to that class of education. In conclusion, the president expressed indebtedness to those men, both within and without the profession, in foreign countries as well as in this, who by study and experimental research were continually adding to an exact knowledge of the great sources of power in nature—that power, the direction of which to the use and convenience of man, constituted the fundamental element in the charter of the Institution of Civil Engineers.

RAILWAY CARRIAGE LIGHTING.

Although great progress has been made of late years towards the efficient lighting of railway carriages by the introduction of gas for that purpose, it would appear that there is still room for improvement, especially in the illumining of carriages with gas for long journeys. For short journeys ordinary coal gas answers to a certain extent on the metropoliton lines of railway, but there is the objection that the reservoirs on the carriages have to be replenished many times during the day. On the Great Eastern and the Metropolitan lines of railway a system of carriage-lighting, by means of an oil-gas used under pressure, has been for some time in partial operation, but we are not aware that this system has as yet been applied to long-journey and express trains. The Great Northern Railway Company, however, are now affording facilities for testing a new kind of enriched gas, placed under compression, which, so far as at present experiments have shown, appears to fulfil all the necessary conditions required of a railway carriage light, especially those of brilliancy, steadiness, permanency under extremely low temperatures, and adaptability to long journeys. The illuminant consists of ordinary coal gas of 16-candle illuminating power, enriched with hydro-carbons under the influence of heat. Ordinary London gas is composed of about 94 per cent of hydrogen and marsh gas and 6 per cent of hydro-carbon gases. The properties of the hydrogen and marsh gases are rather heat-producing than light-giving, so that the light-giving power is mainly due to the small percentage of the hydro-carbon gases present in the bulk. One of the richest of these latter gases is naphthalene, which, however, will of itself, under certain conditions, solidify, separate from the gas, and become deposited in the form of crystals, thus depriving the gas of the benefits of its presence as an illuminant. By the addition, however, of certain other hydro-carbons it is found that the solidification of this napthalene is prevented, and its retention insured in the bulk of the gas in the gaseous form. It is thus rendered available, together with the additional hydre-carbon gases, for raising the illuminating power of ordinary coal gas to a very high standard.

The method of effecting this transformation is the subject of a patent which has been taken out by Mr. William Sugg, of Westminster, in conjunction with Mr. F. W. Clark. In practice the hydro-carbon illuminants are supplied to the ordinary gas at such a temperature as to prevent the deposition of the naphthalene which always occurs in cold weather. These extra illuminants are obtained either from naptha or light petroleum oils. The hydrogen and marsh gases in the coal gas have a great affinity for the rich hydro-carbons of which they absorb a certain definite quantity which they retain permanently after being subjected in combination to a temperature of from 600 to 800 deg. Fahrenheit. The ordinary gas thus highly enriched passes on its way from the commingling apparatus to a gas-holder or receiver, in which it is stored for use under a pressure of about 120lb. per square inch. In this way the ordinary 16-candle gas becomes transformed into 40-candle gas, its illuminating power being thus more than doubled in proportion to its bulk. The practical application of this principle has been taken up by Mr. T. C. Hersey, on the part of the Gas Light and Coke Company, of which he is the chief inspector, and the experiments are being carried out at the company's expense. One of their gas stations adjoins the Great Northern Railway at King's Cross, and there the necessary apparatus for the manufacture of the enriched gas has been erected and is working under the charge of Mr. John Clark. The method of production was recently inspected by us as well as the results of its use in one of the Great Northern Railway carriages. Upon the matter being introduced to Mr. Oakley, the superintendent of the railway, that gentleman at once directed a carriage to be fitted with the lamps and necessary apparatus, which were designed and applied by Mr. Sugg. The apparatus consists of four iron store-cylinders, or reservoirs, each 15ft. long and 8in. in diameter, and placed on the roof of the carriage. From these reservoirs small pipes convey the gas to the lamps, which are fitted with governors, and supplied with the necessary arrangements for controlling and economising the supply of gas. The lamps are of nickel silver and very ornamental in appearance, the rim around them being perforated and forming an efficient ventilator for each compartment. The vitiated air is drawn off by the induced current caused by the lamp flame and escapes by way of the roof. The supply of gas to the carriage is conducted from the adjacent gas works by a pipe laid underground to the railway platform, the connection for the supply to the carriage being made by means of a flexible hose. The gas is stored under a pressure of from 50lb. to 70lb. per square inch in the reservoirs, and such is the durability of this small bulk that the carriage has made the journey to Leeds and back with one charge of gas, the lamps in each of the four compartments being kept burning all the time. The journey has been several times repeated with the same results, and during the late severe weather, several inches of snow on the roof failing to affect the gas in any way. The gas, in fact, has been allowed to remain in the reservoirs on the carriage for a week exposed to the cold, without any condensation or deterioration occurring.

Such has been the success of the first practical application of this system to railway carriage lighting that Mr. Oakley has directed another carriage to be fitted by Mr. Sugg, and in this one some improvements in minor details suggested by experience are being introduced. This carriage is to make the journey through to Aberdeen with one charge of gas. Should this succeed—and there appears to be no reason why it should not—the further, if not the general, application of this system may be looked for on the Great Northern Railway. This may, perhaps, lead to its adoption on other lines where the oil lamp is still in use, as a railway company has only to take a supply of ordinary coal gas from any convenient point at which it is used on their line and enrich and supply it to their carriages themselves. This can be done at a comparatively small cast, and with apparently the most satisfactory results, for which the travelling public will greatly thank them.

AMITIÉ.

Tho' absent, thou art not forgot,
 Thy spirit cheers me still;
Illumes the same, tho' thou art not,
 The same my senses fill!
Lives not the lily pure and true,
 Tho' winter winds may blow,
In spring to breathe to life anew,
 When fades the frozen snow?

The time that parts us may give pain;
 If pain brings peace to me,
It is to feel it is not vain:
 That friendship's bound in thee!
When once the ivy's twined the bower,
 The closer still it clings!
When shines the sunlight thro' the shower,
 The songster sweeter sings!

Oh! may the new year coming make
 A ring of golden hours,
And happy be for thy dear sake:
 A fountain 'mid fair flowers!
Bright gems there are which ever shine;
 But one 's unseen to-day,
That I would greet in sparkling wine,
 And nurse in love for aye!

Henry George Hellon.

31st December, 1879.

Grapharo.—We are requested to state that a specimen of this instrument (described in another column), can be inspected at the Inventors' Patentright Office, 21, Cockspur Street.

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Past Presidents:

SIR DAVID BREWSTER, K.H., LL D., F.R.S., &c., from the establishment of the INVENTORS' INSTITUTE, till his decease, February, 1868. LORD RICHARD GROSVENOR, M.P.

President, SIR ANTONIO BRADY.

THE SESSION 1879—1880

Members' Meetings will be held at 8.15 p.m. on Thursdays, February 5th and 26th. March 11th and 25th; April 8th and 22nd; May 6th; and June 3rd.

At the meeting on the 5th February, "The Patent Law Reform Question."

On 26th February "On Brilliancy in Lighting," specially with reference to the use and misuse of the Lime Light, by J. Cadett, Esq. Illustrative experiments will be given with this paper.

Annual General Meeting, Thursday, May 20th, at 4 p.m unless otherwise arranged.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

Proceedings of the Institute.

MEMBERS' MEETINGS.

On January 8th Mr. F. W. CAMPIN read his paper on the Present Position of Electric Lighting. It was one of considerable length, and is published in another column. There was not much discussion. Mr. Greenfield moved the vote of thanks to Mr. Campin for his paper, and Mr. Morgan seconded the vote, which was passed unanimously.

On January 22nd Mr. Purdey's paper on Miners' Safety Lamps was read by Mr. Morgan. In it special reference was made to Mr. Purdey's invention of an improved safety lamp, and Mr. F. H. Varley, Mr. Greenfield, and Mr. M. Zingler, who spoke on the subject, expressed their approval of Mr. Purdey's lamp. [This paper we cannot publish in our present issue].

EXECUTIVE COUNCIL.

On January 22nd, Mr. F. H. VARLEY, Chairman of the Executive Council, presided at this meeting, when the question of steps to be taken in regard to Patent Law Amendment in the forthcoming Session of Parliament were considered, but the question was adjourned till the next meeting.

It was resolved that in order to meet the necessary expenses of the Institute in carrying forward its work as to Patent Reform, a special subscription list be opened. The usual routine business concluded the proceedings.

Monthly Notices.

Dr. Percy's resignation of his position as Metallurgist to the Royal School of Mines has been accepted. But the laboratories at South Kensington are not ready for the students, and Mr. Richard Smith, Dr. Percy's laboratory assistant, has been requested to continue the lectures in the theatre of the Museum of Practical Geology, and the instruction *pro tem.* in the laboratory in Jermyn Street.—*Athenæum*.

Superior Magnets in Cast Iron.—According to the method of M. Carré in the *Revue Industrielle* is as follows:—He melts cast iron very slightly carburetted in earthen crucibles. He adds to it 1·5 per cent nickel, 2·0 per cent tin, and 0·5 per cent of copper. The result is stated to be very remarkable.

Not the least of Dr. Farr's claims, says the *Athenæum* (and we endorse this), on our gratitude is based on the literary skill which enabled him to make his "Life Tables" and other reports thoroughly readable as well as instructive. His epigrammatic style enlivened the dullest statistics; and he made us realize the truth of his own assertions, that "statistics underlie politics," and "statistics are a mode of national self-knowledge." Dr. Farr was a happy coiner of words and phrases, and to him may be attributed the introduction of more than one pregnant term in the sciences of nosology and biology—"zymotic" to wit. Now that the nation has finally lost his services through party political moves, we think it is nothing but right to testify to the value of his services.

The Gum Euphorbiaceæ of Natal, according to a statement in *Les Mondes*, if dissolved in alcohol and applied to metallic objects, preserves them from the action of sea and brackish waters. It is also said to preserve articles of wood from the ravages of the white ants.

Artificial Production of Diamonds.—In continuation of the criticisms on this subject, we extract the following from the *Athenæum*:—As soon as Mr. Maskelyne's letter appeared, Mr. Mactear wrote to the *Times*, affirming "in the most positive manner I have been able to produce carbon in the diamond modification; I have been able, on the only two occasions I have tried the experiment, to burn the small translucent particles in oxygen gas, and I have been able to scratch deeply both amethyst and topaz with them." On the sixth of January, Mr. Mactear went to the British Museum, "to convince Mr. Maskelyne himself of his being, to say the least of it, premature in his conclusions." He worked four days with the scientific men there, and what happened is set forth in his letter to the *Times* of Friday, the 16th; he there says: "The crystalline substance which I believed to be carbon in that condition is not so; it consists almost entirely of silica and alumina, and a small amount of magnesia, as well as a residue insoluble in hydrofluoric acid, even after the action has been prolonged over more than forty-eight hours. The residue, fused with caustic soda, still contained a very few minute crystalline forms, and particles of what we assume to be carbon in some graphitic form, which burns away on the application of a strong heat." Again, he says: "The pressure of carbon in some graphitic form will serve to explain the difference of opinion as to the combustibility of the substance, as, while a portion undoubtedly burns away, another, and by far the larger portion of the sample of crystalline substance we have been working upon, is little, or not at all, affected by a very high temperature." And, in conclusion, he writes: "While I most frankly admit that in this case my experiments have resulted in failure in so far as the production of crystalline carbon is concerned, yet the obtaining of substances closely resembling it in so many respects, and which seems actually to be of the nature of sapphire and ruby, is sufficiently interesting, and gives encouragement to continue the investigation which, sooner or later, I am certain will be successful."

The Educational Year Book for 1880, which has been recently published by Messrs. Cassell & Co., has this year been enlarged in order to make room for such topics as female education, professional and technical education, &c. Additional matter has also been introduced into those sections which deal with middle-class schools, the universities, local examinations, &c.

The lectures and lessons for teachers on the Science, Art, and History of Education will be resumed early this month at the College of Preceptors.

The Scientific Review

FEBRUARY, 1880.

ELECTRIC LIGHTING.

Electric lighting being one of the foremost subjects of the day, we think it desirable to give a prominent position in our columns to the paper "On the Present Position of Electric Lighting," by Mr. F. W. Campin, read at the meeting of the Inventors' Institute on 8th January. It was as follows:—

The time that has elapsed since I brought under the notice of the members of the Inventors' Institute a summarised account of the various plans of electric lighting then existent has not been idle time for the promoters and improvers of that system of lighting seeing it is happening just as I ventured to hint, that the shortcomings of the different inventions then before the public would be met and overcome. And although one cannot even now say that all practical difficulties have been removed, yet so much has been done in the direction of removal of practical objections that the Thames Embankment still continues to be lighted by electric lamps, and a thoroughly practical, and it seems highly successful, adaptation of the system has been effected by lighting the reading-room of the British Museum, and, according to what we hear, this is considered to be a very successful affair. In this case Dr. C. W. Siemens' invention has been adopted, and appears to give general satisfaction, which is what any one might expect who knows anything of that scientific celebrity, and bears in mind the fact that his invention has for some considerable time past been regularly and constantly employed in some of the extensive workshops of Messrs. Siemens Brothers, at Woolwich, with perfect success, where the men have become so accustomed to its bright and cheerful rays that they would not again work by gas-light if they could help it. When we state that one electric lamp, with suitable reflector, placed in a workshop, say sixty feet square, would give sufficient light over the entire area of the apartment for all practical purposes, it will be seen that for workshops the electric light is well suited. In cases where steam-power is not employed a gas engine may be applied with advantage, since it requires little or no attention after being got in motion.

For printing establishments, but more especially in the composing rooms, where a great number of gas-burners are generally required, and by which not only does the atmosphere become deprived of its oxygen, but vitiated by the accumulation of carbonic acid, the electric light would be of invaluable service. The atmosphere of some composing-rooms is so oppressive and unhealthy from the excessive, but necessary employment of gas, that it is not to be wondered at the average life of the compositor is estimated at about forty years. The electric light would probably increase his longevity while adding to his comfort during the nocturnal hours of labour.

When several workshops, compositor's rooms, or various apartments in a building are required to be lighted by electricity, the alternating current machine and differential lamp of Messrs. Siemens may be judiciously employed. The division of the light by this means is exceedingly important; and since it has been successfully adopted at the Library of the British Museum and elsewhere, it is, of course, applicable wherever a series of lights are required from a single machine.

Perhaps as good a summary of what has been done in regard to electric lighting as one can expect to have has been given by a journal of great authority on electrical matters, the *Electrician*, which in its issue of January 3rd, 1880, states:—

While no startling discovery has been made, progress has been continuous. We long ago pointed out that the future of the electric light was more a question of perfection of details than of new discoveries. Improve the machine, improve the lamp, and every step will be a gain. We think, although the opinion may be wrong, that the Gramme machine only requires improvements in certain directions to make it almost perfect, and that the time spent upon attempts to discover something new will not be so well spent as in attempting to improve what we have. As we say, some improvements have been made during the past year. The sole license for the Gramme machine here is the British Electric Light Company, 41, Parliament street, E.C., and the experience of this company during the year is worthy of record. We learn that, owing to the variety of demands springing up for these machines, the company have produced some new classes of machines on the Gramme principle which are giving very satisfactory results. Several of these new machines—which have only been in existence a few weeks—have already been sold. Another important advance made by this company is the acquisition of an arrangement for dividing the continuous current derived from the Gramme machines. This division is effected by aid of Blandy's patent magnetic governor coil. Many firms have already used the "coil" with satisfaction. The old problem of one machine and one lamp is therefore very wisely disputed. One important feature in the British Electric Light Company's position is to be found in the fact that, while being in possession of the Gramme machine, they are not prejudiced as to any particular lamp, but use all approved lamps best adapted to meet their various requirements. Among the more important contracts carried out by this company during the year may be mentioned the lighting of the Picton Reading-room, Liverpool; the steamship Mendoza; the North Shore Mills Company, Liverpool; the London and North Western Viaduct at Llandulas, the Milford Docks, South Wales; the Mersey Dock Works, Liverpool; and many others. With reference to the Picton Reading-room we noticed in a recent number of the *Times* that when the subject of the payment for the work came before the Corporation Committee the Liverpool borough engineer stated that the light as now applied was undoubtedly "a great success," while one of the members of the Committee said: "I think it is the most successful application of the light that has been seen in any part of England to the present time." With this testimony, we think the past year must have been a very satisfactory one in this country for the meritorious Gramme machine in the hands of the British Electric Light Company. We may add that the recent successful exhibitions of the light given by the company in the St. Enoch's Station, Glasgow, have resulted in their contracting with the railway company for the continued lighting of this large railway station by electricity, supplied, of course, by Gramme machines. It is well known that the experiments on the Thames Embankment have been very successful. The number of lamps has been largely increased, and it has been found that the magnificent engine of Ransomes, Sims, and Co. is capable of supplying the power requisite to drive the Gramme machines required for these lights. We have from time to time noticed the progress made, and thus may merely mention here that the engine and machines are stationed at Charing Cross Station, whilst the lights range from Blackfriars Bridge to the Victoria Station on the Metropolitan District Line. The rival of the Gramme machine is that of Siemens. The Lontin system has been very successfully applied at the Aldersgate-street Station of the Metropolitan Railway by the Electric Generator and Light Company.

Whatever merits may appertain to any of the plans of electric lighting that have been tested and applied, there is yet one system comparatively unknown in this country, that is the one known as the Brush system, which is thus referred to in an ably-written article in a recent number of the *Mining Journal*:—

It must have been almost obvious to most electricians, however much they may have hoped that they might be mistaken, that to make electric lighting a success it was necessary to construct an arc-light regulator or lamp, as it is more popularly called, as simple and at least as cheap as the lamps on the incandescent systems, and one with which a continuous current could be used, for it must be remembered that when the electricity is obtained from any dynamo-machine it is for continuous currents simply necessary to generate the supply required to compensate for the actual consumption, all the residual current being utilised; but for alternating currents there must be so much electricity generated as is required to make up for the loss of residual current at each reversal. These are the kind of facts which appear, from the results obtained, to have been most carefully kept in view by Mr. C F. Brush, from whom the Brush system of electric lighting takes its name, and consequently he has produced a really reliable and economic electric light. Hitherto the best results obtained appeared to lead to the conclusion that 1½-horse power indicated would have to be accepted as the minimum power required for each light, and that five lights on a circuit was practically the limit even when all the conditions were favourable, whilst in many cases 1½-horse power per lamp represented but a small fraction of the power actually consumed.

The Brush system, as shown in operation by the Anglo-American Electric Light Co. at their works in Hatton Garden, the *Mining Journal* avers, showed that both these views were erroneous for 18 lights, each of 2000 candle power, were maintained on a single circuit with a 16 light Brush machine, driven by an 8-horse nominal engine, using 60 lbs. pressure of steam (and frequently a few pounds less), and yielding on Tuesday evening almost exactly 13½ indicated horse-power. The generators, the lamps, and the carbons are all the invention of Mr. Brush, and it is by the use of the three in conjunction with each other that the excellent results noticed have been obtained. The Brush dynamo-machines differ essentially in construction from all others in the armature in the arrangement of the field magnets, in the commutator, and in the novel mode of connection, thereby producing from a given amount of power a larger available current than has hitherto been obtained from any other combination At the same time, the mechanical construction is such that the wear and tear is reduced to a minimum, the wearing parts (the segments of the commutators and brushes) being easily replaced when necessary by an ordinary mechanic at a trifling cost.

Another advantage which the machines possess is that they may be run for any number of hours continuously, and do not overheat or become less effective through continued use; further, by a special regulating attachment any smaller number of lights than the maximum that may be required can be employed, absorbing proportionately less power. The current derived is continuous, and of such a nature that it can overcome great external resistance. On the evening of exhibition the 16-light Brush was, with the horse-power already mentioned, running at a speed of between 700 and 750 revolutions of the armature per minute, and was generating ample current for 18 lamps, which were temporarily used, although the sixteen lamps which were used during the greater part of the evening are said (though the difference is not appreciable by the naked eye) to give the maximum of candle-power. The whole twenty-one lamps were on one circuit, which, by the use of a simple shunt, was constantly varied (though with no apparent difference of effect) from 250 ft. to 1½ mile, the arc in each lamp being 2 millimetres, or 1-12th in., in length, and each lamp consuming approximately 1½ in., or allowing for wasted ends 2 in of carbon per hour, the cost retail of the carbon being 4d. per foot.

The Brush lamps or carbon regulators have all the advantages of—indeed, are in some respects superior to—the Serrin, which has hitherto been regarded as the best arc lamp constructed, whilst it is vastly more simple, less liable to derangement, and probably not one-tenth the price. The peculiar features of the Brush lamp are simplicity of construction, ensuring ease of management, safety against internal derangement, and regularity of working. The lamps contain no clockwork or other similar mechanism, and no regulation or adjustment of any kind is required beyond that of renewing the carbons when consumed. By means of the magnetic control and automatic cut-off each lamp, though in continuous circuit with many others, is independent in its working. Thus a mean length of arc, and equality of light and consumption of carbon is always maintained. The cut-off effectually guards against all dangers of general extinction; should any lamp in the circuit be accidentally injured or thrown out by consumption of carbon or other cause, the remainder are not affected. The simplicity of this cut-off could scarcely be surpassed being merely a small electro-magnet, which is dormant so long as the lamp is in proper action, but the slightest irregularity permits a portion of the current to pass through the coil, pulls up the armature, and throws the lamp out of circuit Should, however, the irregularity arise from a defect in the carbon, the lamp comes automatically into the circuit again as soon as the points regain correct position, which is of course the work of but an instant, the armature is released, and all goes on as before.

As evidencing the strong assurance that now exists that electric lighting is regarded as having obtained a somewhat certain position as a practical system of illumination, it may not be out of place to state that a new periodical, bearing as its sub-title the *Electric Light Journal*, has recently appeared which has supplied much of the information already given.

Here it will be desirable to take note that, while the Thames Embankment and Waterloo Bridge are successfully illuminated by the Jablochkoff candle, and the library of the British Museum by the Messrs. Siemens' admirable differential lamp, at last the electric light has found its way into one or two railway stations, that at Aldersgate-st. being lighted by the Lontin system, as above-mentioned, and Victoria Station by the Société Générale d'Electricité of Paris. The latter demonstration being described in the *Daily Telegraph* in a very intelligible way, it will not be out of place to quote the report of that journal:—"It is necessary to state, in justice to the French company and its managing director and engineers, that their experiment is not intended for continuance beyond a certain number of evenings. Were it supposed that the present undertaking is designed to be permanent, the inference would naturally be drawn at the expiration of the time agreed upon that the lights were withheld because the trial had failed. Nothing further from failure could possibly be imagined than the result of yesterday's operations, the effect being indeed a success more brilliant and entire than any yet attained by the system now in use. It was especially noticed by all who attended this interesting exhibition of underground illumination that the light burned with perfect steadiness, and without the least change of colour. The evidence recently given by Mr. Shoolbred on the subject of electric lighting, to the effect that fog has little or no perceptible influence upon its brilliancy and illuminating power, was confirmed in a remarkable degree, for while the dense mist that poured downward from the neighbourhood of the river, beneath the level of which the station is situate, caused the gas-lights to burn dimly, a totally opposite effect was apparent in the opalescent globes containing Jablochkoff candles. No machinery is placed at the station itself, the highly-insulated wires being laid along the tunnel and brought within the vault where the pumping engine is at work night and day to keep out the water which oozes through the gravelly soil. The lights at Victoria are maintained by the same steam power which produces the forty lights on the Thames Embankment and Waterloo Bridge, so that the twenty-horse engine of Messrs. Ransomes, Sims, and Head, worked near Charing Cross, is now maintaining sixty lights, and when a fourth battery of twenty-light Gramme machines, which has just been erected, shall be in use, will feed a total number of eighty lamps between Blackfriars and Victoria. Among the party who witnessed yesterday's experiment were Mr. Forbes, Mr. Mortimer Harris, Captain Godbold, and Mr. Vincent Hill, on the part of the railway company, and M. Jules Gaudet, managing director, and M. J. A. Berly, engineer, of the Société Générale d'Electricité. Punctually at half-past four o'clock, a little girl, daughter of the French engineer, was lifted on to a table in front of the wires, and by a simple action completed the two circuits of the Gramme battery, when all the ten lamps outside the cavern leaped splendidly into light as brilliant as a summer day, to the great astonishment of the assembled public on both platforms. Nine of the globes are distributed at intervals, and at a height of rather more than four yards above the foot-level on either side the railway, five being suspended over the down and four above the up platform. The tenth light is over the centre of the bridge that crosses the station. It may be observed that the distance marked on the chart of the District Railway between the stations of Charing Cross and Victoria is 2,373 yards; but the length of wire brought into use is considerably more than three miles. The actual frontage now illuminated by means of the central machinery at the Charing Cross point of the Embankment is nearly two miles and three-quarters."

Amongst names well known in connection with the practical application of electricity, Edison is perhaps as well known as any. It seems he has lately been operating for the improvement of the electric light with considerable success, as the following extract from the *Times* states that in the summer of 1878 Edison's experiments began to be made with the electric light. He supposed at first that the whole battle was won when he had found a plan to divide the electric current. He adopted for a lamp a coil of platinum wire, and endeavoured to perfect a regulator of the current which would allow the coil to become luminous without becoming so hot as to melt. He laboured diligently to perfect this device until about two months ago. About 17 feet of fine platinum wire were used in his coil. His first trouble grew out of the tendency of the current to form a voltaic arc between adjacent parts of the coil. Every time that an arc was formed his wire melted and disappeared in a flash of sparks. To insulate the coil with some material which would also become luminous was his constant effort. Zinc was tried and other materials. Wire made of iridium and other hard metals and various minerals were used, but all without success. Then the idea of enclosing the wire in a globe of glass from which the air had been exhausted occurred to him. Weeks and months of costly experiment with this idea followed. The vacuum was useful as it economised force. The radiation of heat was not so great in a vacuum, and a larger proportion of the energy of the current was saved for maintaining the luminous incandescence of the wire. The experts foresaw failure long before Edison did; and, finally, Edison himself reluctantly came to the conclusion last fall that he was on the wrong track entirely. The man wore himself out very nearly, and the disappointment almost sent him to his grave.

About two months ago the inventor resolved to test the utility of carbon. He was determined not to surrender until that had been done. What inspired him to make this departure was a trivial incident. One day he was busy with some lampblack and tar, with which he was making some wafers for a telephone. Happening to rub some between his fingers, he found he could draw it out into a thread. The thought came into his mind, "Why can I not make a carbon wire for an electric lamp?" After a little consideration, he began a series of experiments in this direction. He found that he could easily make a carbon wire. as had occurred to him, and that a burner for a lamp could be made from it. After several weeks of effort he found that a carbon wire, enclosed in a hermetically sealed glass globe, from which the air had been exhausted, would do well for a short time. It made a good light, and was satisfactory in that respect, but it was not durable. Invariably it was soon consumed. He then thought of the idea of taking a simple cotton thread, carbonising it in a retort, and making coils out of that All sizes of thread and twine were tried. But even this material would not do. The texture of the carbonised thread was too loose. The material was better than lampblack and tar, but was not good enough. Then Edison tried common paper. He cut out thin strips of various kinds of paper, which he carbonised as before by laying them between sheets of tissue paper, enclosing them between cast-iron plates, and subjecting them to intense heat in a muffle furnace. The slips were cut out in the form of a horseshoe. One of these slips, made from Bristol board, was enclosed in a vacuum (if that be a proper expression) in a glass globe, the electric current being conducted to and from it by means of platinum wires. This was three or four weeks ago. The lamp thus made was tried. The horseshoe of carbonised paper became incandescent, and gave a beautiful mellow light, equal to that of one gas burner. It did not consume, and it lasted very well during the first day of experiment. Next day the same lamp was tried again. It behaved beautifully, somewhat to the surprise of Mr. Edison and his assistant. Both men now became very much interested. They instructed their glass-blower to make several lamps with great care; the pump perfected by Crookes and Sprengel was used to exhaust the air from the globes, and particular attention was paid to the matter of sealing the stems of the globes, which was done with a blowpipe About two weeks ago experiments began with these lamps. They all behaved well, and a few days more served to show that a valuable invention had finally been evolved from the busy brain of the philosopher of Menlo Park. In fact, the lamp appeared to be complete.

A whole crop of new questions now sprang into view, one of them being the durability of the new style of incandescent carbon under a strong current. This question was readily disposed of. One lamp was raised to a power of 30 gas burners with perfect safety, and the capacity of the paper carbon to withstand an intense current appeared to be proved. As it is not the intention of Mr. Edison to make lights for dwellings of greater power than one or two gas burners, he considers that this part of the problem is disposed of. If a burner can be made to give the light of 30 gas burners with safety, it can surely be relied upon to give the light of one or two. Then came up another question. Ten lights could be maintained in the laboratory with the expenditure of one-horse power, or eight net in a dwelling. In practical use the current would be turned off and on suddenly Would not the sudden turning on of a current of electricity, equal to one-eighth of one-horse power, rupture the carbon in time? One-eighth of one-horse power will drive several sewing machines, and when administered in the form of a blow is all a man would ever wish to have applied to his person. One of the men in the shops was detailed to turn on and off the current of electricity at one of the lamps The man did this 5,000 times, which would be about the number of times that a lamp would be lighted in a dwelling in the course of 10 or 12 years. The lamp withstood this test perfectly. Various other questions came up and were promptly solved in the same manner by actual experiment. The state of feeling which reigned in the shops at Menlo Park as these experiments went on, and as it was found that the lamps sustained every test. can better be imagined than described. Every man, from Mr. Edison down, was first astounded and then exhilarated. They have had so many failures that they can now scarcely believe their senses.

There are now 45 lamps lighted every evening at Menlo Park, and the number is being increased as fast as the lamps can be made. Two or three of the dwellings in the village have been supplied with them, and a dozen or more street lamps along the road leading to the railway station have also been furnished with them. The others are in the shops. One of the latter has now been in use day and night for fifteen days, and is as good as when first put into operation.

The invention of this new lamp has not produced any very striking effect in regard to gas stocks here yet Scepticism in regard to Mr. Edison's achievements is too strong yet. But a very decided effect has been produced with reference to the stock of Mr. Edison's Electric Lighting Company. There are 3,000 shares in the capital of the company, the par value of each being 100 dols. This stock was down to 20 dols. a share last summer, and a large number of the present holders bought at that price. The rise in value during the last two weeks has been enormous. The Hon. Roscoe Conkling, United States Senator from New York State, bought several shares this past week, and paid 3,000 dols. apiece for them. August Belmont, the banker, has bought during the past week at 3,500 dols. a share, and will take all that are offered at that price. Drexel, Morgan, and Co., bankers, who are already large holders, and, in fact, the principal owners are also buying at similar prices. There has been nothing like it in the history of stocks in New York city. Very few large holders of shares in the Edison Company are now willing to sell at 3,500 dols.; and the majority of the small proprietors are demanding and waiting for 5,000 dols. a share. The stock may never go to that height, because experiment may develop defects in the new lamp not yet observed; but the feeling in the company now is one of perfect confidence that the problem of household illumination has been solved, and higher quotations are predicted by them. The company is composed of merchants and bankers of high standing, and few of them are willing now to sell out except for very great inducements.

Mr. Edison himself does not indulge in extravagant assertions. I had a long talk with the inventor to-day and went with him all over the shops, learning every detail of construction of the lamps and examining the generators, air-pumps, furnaces, motors, and other apparatus. Mr. Edison makes no predictions, but says that he is going on until he has 150 lamps of the new pattern burning in the dwellings and streets of Menlo Park. It is his own test of the merits of the new lamp, the object being to develop defects. A few weeks from now he will be able to formulate a clear opinion about the merits of the invention. Wires are meanwhile to be run down to the village of Rahway, four miles distant, in order to test the difficulties of distributing the mains and lamps over a large area. Until the *data* afforded by the whole of this test are collected Mr. Edison will not declare his final opinion about this matter. He believes, however, that the new lamp can be distributed over a large area, and houses lighted therewith for the same price as now paid for gas, possibly less, but of the latter he is not certain. The lamps are four inches high, are simplicity itself in construction, and will cost to construct only 25c. apiece.

Although various prominent systems and applications of the electric light have thus been passed in review, yet it would be improper not to remark that other systems of more or less merit are now before the public; but want of time and difficulty in getting accurate information as to them prevents any detailed account being now given. However, it is to be hoped that inventors or promoters will at some future day bring them under the notice of the Inventors Institute.

THE SOCIETY OF BRITISH ARTISTS' WINTER EXHIBITION.

[By a Correspondent.]

In this gallery there are nearly 900 pictures, many of which possess peculiar artistic features. Each work is priced in the catalogue, a system which it would be well for the Royal Academy to follow. In the first room (21), Cleopatra's Deadly Resolve in the Temple of Isis, by Madame de Steiger, is a classical picture possessing fine artistic qualities. The works of this clever artist have in some provincial exhibitions won favourable notice for their delicate colour and drawing. Cleopatra is represented reclining on a couch contemplating her fatal death. The whole work is admirably painted, solid and rich in tone and colour, while the face is an excellent study of character. There is a fixed purpose in the eyes, lowering with strong passionate will, and superstitious fears. A somewhat similar expression we have observed in Edward Long's masterly Egyptian studies. Above is a canopy, the perspective and tint of which is unique, and in the rear are Egyptian figures in keeping with the subject. We cannot but regret that this picture, which the judges have deemed worthy a place in the first rank, should be so badly hung. (14) At Mechlin—by M. P. Mead—is also a well painted picture representing a bridge over the river Dyle. The colouring is bold and original: we think this artist exhibits great promise. (26) Gate of Nicosia, Island of Cyprus—by H. Carrodi—is an attractive picture representing the market people entering the town. (151.) Wild Flowers—by A. F. Patten—the chief charms of this picture are the children crossing the brook. The whole has a pretty effect, and the tints are happily harmonized. This artist has been at some pains in drawing his figures. (211.) Playmates—by H. H. Couldery—is one of this well-known artist's charming pictures of his favourite cats, which studies have called forth the admiration of Ruskin, and other notable art critics. (246.) A Weedy Corner in the Isle of Wight. This picture carries one of the most charming spots in the island—the Undercliff. The wild flowers intertwined with the weeds form a scene of decided beauty.

There are many attractive pictures in the gallery this year, which need only be seen to be appreciated.

Mr. **Aaron T. Hammer**, of Sedan, Kan., has patented an improved sewing machine motor, which consists in the combination of devices by which the vertical motion of a platform is converted into rotary motion and transmitted to the band wheel when the platform moves down.

Proceedings of Societies.

ROYAL SOCITEY.

Dec. 11th.—The President in the chair.—The President announced that he had appointed as Vice-Presidents the Treasurer, Mr. Busk, Sir J. Hooker, Mr. Simon, and Dr. Tyndall. Prof. J. D. Everett was admitted into the society. The following papers were read: "Thermo-electric Behaviour of Aqueous Solutions with Mercurial Electrodes," by Mr. G Gore; "Further Experiments on the Vapour Densities of Potassium and Sodium," by Prof. J. Dewar and Mr. A. Scott; "Quantitative Spectroscopic Experiments," by Profs. Liveing and Dewar; and "On the Practical Solution of the most general Problems in Continuous Beams," by Messrs. J. Perry and W. E. Ayrton.

Dec. 18th.—The President in the chair —The following papers were read: "On the Secular Changes in the Elements of the Orbit of a Satellite revolving about a Tidally distorted Planet," by Mr. G. H. Darwin; "On Buff's Experiments on the Diathermancy of Air," by Dr. Tyndall; "On the Photographic Spectra of Stars," by Mr. W. Huggins; "On a new Method of Spectrum Obeservation" and "Note on the Spectrum of Hydrogen," by Mr. J. N. Lockyer; "On the Capillary Electroscope" and "Chemico-Electric Relations of Metals in Solutions of Salts of Potassium," by Mr. G. Gore; "On the Spontaneous Segmentation of a Liquid Annulus," by Mr. A. M. Worthington; "On the Histology of *Hydra fusca*," by Mr. T. J. Parker; and "On the Artificial Formation of Diamonds," by Mr J. Mactear.

Jan. 8th.—The president in the chair.—The Right Hon. Lord Northbrook was elected a Fellow.—The Bakerian lecture, "On the Photographic Method of Mapping the Least Refrangible End of the Solar Spectrum," was delivered by Capt. Abney.

ASTRONOMICAL SOCIETY.

Dec. 12th.—Lord Lindsay, M.P., President, in the chair.—Mr. Stone showed a micrometer which he described as a compromise between the German and English forms. Mr. Neison read a paper, by Prof. Newcomb, "On the Correction of the Mean Longitude of the Moon." Referring to a paper published by Mr. Neison in the "Monthly Notices," Prof. Newcomb remarked that the fluctuation of the moon's errors, which Mr. Neison had suggested might be accounted for by a seventeen years' term, due to the action of Jupiter, should reach one of its maximum periods in 1878. According to Prof. Newcomb's computations, the observations of 1876 were not accordant with this theory by about 2″, and he suggested that this small residual error might be accounted for by an alteration of the personal equations of the observers at Greenwich and Washington, the only two observatories where a continuous series of observations of the moon's place were taken. Mr. Neison also read a paper of his own, prepared without any knowledge of Prof. S. Newcomb's suggestion, in which he discussed the changes in the moon's place as compared with the personal equation of the various observers who have succeeded one another at Greenwich Observatory. Mr. Ranyard read a paper by the Rev. T. W. Webb, "On a new Gaseous Nebula in Cygnus," which, when observed with a low power, looked like a bluish star of the ninth magnitude, and had been observed and registered as such by Arglander in the *Bonner Durchmusterung* as No. 4004 of zone +41. Observed with a higher power, it was seen to be a minute planetary nebula with a stellar nucleus towards the north preceding edge. Observed with a spectroscope at Lord Lindsay's observatory, it showed the same bright lines which had been observed in many other gaseous nebulæ. Mr. Common gave an account of his observations of the satellites of Mars, as seen with his 37-inch Silver on glass reflector. Deimos now appeared to him as bluish, though, at the last opposition, he had thought it had a reddish tinge, which he had then compared to the redder parts of the planet's disc. For observing position angles of the satellites he had made use of a screen of dark glass across half the field of a negative eye-piece, so that the planet and cross wires could be faintly observed without dazzling the eye while the satellite was being compared with the position wires. Lord Lindsay read a note on the spectrum of the red spot on Jupiter, which he found to be an absorption spectrum, extending from the extreme red end up to a place between F and G, which he estimated as corresponding with wave-length 513mmm.

Jan. 9th —Lord Lindsay, M.P., President, in the chair.—Messrs E A J. Crossley, W. S Franks, A. Riches, J. F. Sloman, W. Smith, and Rafael Rorg y Torres, of Barcelona, were elected Fellows —Mr. Glaisher called attention to the magnificent Star Atlas and Catalogue of Dr. Gould, which have just been published by the Argentine Republic —A paper, by Mr. H. Pratt, was read, "On the Rotation Period of the Planet Jupiter," which he has determined from observations of the great red spot which for some months past has been visible upon the planet. The rotation period determined is 9h. 55m. 33·91s., which differs about 7s. from the ordinary received rotation period. The observations indicate that if there is any drift of the great red spot on the surface of the planet, similar to the drift observed in sun spots, it must have been very uniform during the 321 rotations that have been observed.—Dr. Huggins gave an account of the methods he had employed for photographing the spectra of stars. The slit of his spectroscope is placed in the principal focus of a 15-in. Cassegrain reflector; one 60° prism of Iceland spar has been made use of. Iceland spar is very transparent to the ultra-violet rays, and has a dispersive power nearly equal to that of dense flint glass. An ingenious contrivance has been devised for keeping the image of a star upon the slit of the spectroscope, which is only 1-350th of an inch broad. No cylindrical lens has been made use of, and a linear spectrum of a star having been obtained the instrument is slightly moved, and another adjacent linear spectrum is taken, until the whole spectrum is sufficiently broad to be conveniently examined under the microscope. Some of these spectra, which are only about half an inch in length, were shown to the meeting. In one of them seven lines can be counted between the H and K lines, proving that the nebulous appearance of some of the broader lines is not due to any want of sharp definition.—Mr. Christie read a paper "On the Systematic Errors of the Greenwich North Polar Distances," and a lengthy discussion ensued upon Bessel's corrections for refraction.—Mr. Martin made an appeal to the Fellows of the Society to observe the brightness of the planet Mars towards the end of February, when it will be favourably placed with respect to Betelgeuse and α Orionis.

ASIATIC SOCIETY.

Dec. 15th.—Sir H. C. Rawlinson, President, in the chair.—A paper was read, contributed by Babu Rajendralala Mitra, "On the Age of the Caves of Ajanta," in which he urged—first, that the figures with flowing dresses and conical hats were Persians; secondly, that the chief personages in the drinking scenes were Bactrian; and thirdly, that the scenes represented phases of Indian life in the first century B.C. or A.D., founding his conclusions on the inscriptions existing in some of the caves, and adding at the same time many details with reference to the individual caves at this place. To this Mr. Ferguson replied that he could not accept the Babu's views for two reasons—first that there was no sufficient proof of the date of the inscriptions in the caves; and secondly, that, supposing they could bear he interpretation put on them by the writer of the paper, the architectural evidence was altogether opposed to his theory. Mr. Fergusson further pointed out that Babu Rajendralala had altogether ignored the fact that an inscription at Badami has preserved the date of 500 years from the coronation of the Saka kings, *i.e.*, A.D. 578-9, and the Babu ought to have known that this date is universally admitted to be the turning point of the cave chronology.

SOCIETY OF ANTIQUARIES.

Dec. 11th.—Dr. C. S. Perceval, Treasurer, in the chair.—Notice was given of a ballot for the election of Fellows on Thursday evening, January 8th, 1880, and a list of the candidates to be put up for ballot was read Mr. P. O. Hutchinson communicated an account of some curious and, as it would seem from local traditions, ancient circular patches on a hill near Sidmouth. Mr. G. Payne, jun., gave an account of a discovery he had made, as recently as the 9th inst., at Chalkwell, near Sittingbourne, of a Roman lead coffin, the lid of which he exhibited, together with two gold armillæ, a jet armilla, and a small gold ring, which were found inside the coffin. Outside the coffin had been placed two large pitchers of red clay, one of them containing two small white, transparent glass cups, the whole being shattered into fragments by the pick. At the foot was a jug of fine hard flesh-coloured ware, originally painted black. On the coffin lid were two diamond-shaped designs, with an X-shaped ornament between them, which appear to have been moulded from a twisted thong. In the centre of each diamond was figured what seemed at first sight a sort of monogram of an I and a B, but which was more probably a representation of an ancient yoke. These also occur above and below the X ornament. There are also plain circular discs over the surface of the lid. Mr. Payne stated that the sides of the coffin itself were partially ornamented in a similar manner. From the size of the armlets and of the ring the interment was evidently that of a very young person. In fact, Mr. Payne stated that traces of the second teeth (not yet come through) were observable. It is seldom that two such remarkable "finds" of Roman remains have been laid before the Society at two consecutive meetings as those of which Mr. Payne has been the fortunate discoverer.—Mr. G. W. G. Leveson Gower exhibited an interesting collection of Roman remains found on his estate at Titsey Place, and communicated an account of successive excavations made by him at Titsey and at Limpsfield, in the vicinity of the "Pilgrims' Way," which runs through his property.—Mr. W. K Foster exhibited a collection of objects found by himself in the lake dwellings at Peschiera. Many of these objects bore a close resemblance to those figured in Mr. Lee's translation of Dr. Keller's great work on lake dwellings, but some of them seemed to present now types.

STATISTICAL.

Dec. 16th.—T. Brassey, Esq., M.P., in the chair.—After the election of new Fellows Mr. R. H. Patterson read a paper, under the title "Is the Value of Money rising in England and throughout the World? With Remarks on the Effect of the Fluctuating Condition of Trade upon the Value of Money."

SOCIETY OF ARTS.

Dec. 15th.—Dr. Graham delivered the fourth of his course of lectures "On the Chemistry of Bread and-Making."

Dec. 17th.—Sir G. Bowyer in the chair

—Seven candidates proposed for election as Members.—A paper "On the Panama Canal" was read by Capt. Bedford Pim, R.N., M.P.

MATHEMATICAL.

DEC. 11TH.—C. W. Merrifield, Esq., President, in the chair.—The following gentlemen were elected Members: Messrs. W. Burnside, J. R. Harris, W. J. C. Sharpe, Dr. W. Jack, and Prof. W. W. Johnstone.—The following communications were made: "Note on a Method of Obtaining the *q* Formula for the Sine-amplitude in Elliptic Functions," by Mr. J. W. L. Glaisher,—"Note on a Numerical Theorem connected with the Cubical Division of Space," by the President,—"Notes on Curvature," by Mr. J. J. Walker,—and "A Property of a Linkage," by Mr. A. B. Kempe.

SOCIETY OF ENGINEERS.

DEC. 8TH.—Annual Meeting.—Mr. R. P. Spice, retiring President, in the chair.—The following gentlemen were elected as the Council and Officers for the ensuing year, viz.:—President, Mr. J. Bernays; Vice-Presidents, Messrs. C. Horsley, T. Porter, and J. Church; Ordinary members of Council, Messrs. S. Cutler, F. E. Duckman, F. W. Hartley, A. Rigg, W Schönheyder, J Walker, P F. Nursey, and C. Gandon; Honorary Secretary and Treasurer, Mr. A. Williams; Auditor, Mr. W. H. Bennett. The President announced that premiums of books had been awarded by the Council to Mr. C. J. Alford and Mr. J. Andrews

SOCIETY OF TELEGRAPH ENGINEERS.

DEC. 10TH.—Annual Meeting.—The following gentlemen were elected office-bearers for the year 1880: President, Mr. W. H. Preece; Vice-Presidents, Prof. Foster, C Siemens, W. Smith, and Major Webber. Council, Prof. Adams, W. A. Androws, W. T. Ansell, Sir C. Bright, H. G. Erichsen, Col. Glover, C. Hockin, Prof. Hughes, L. Loeffler, C. E. Spagnoletti, A. Stroh, C. F. Varley, Members, and A. J. S. Adams, Capt. M. Greer, and J. T. Hill, Associates; Hon. Treasurer, E. Graves; Hon. Secretary, Lieut.-Col. F. Bolton; Secretary, F. H. Webb.

PHYSICAL.

DEC. 13TH.—Prof. W. G. Adams in the chair.—Eight new Members were elected.—Mr. J. H. Poynting read a paper "On the Graduation of the Sonometer," in which he reduced the indications of that instrument to absolute results.—Dr. A. J, Fleming exhibited a new "Wheatstone balance," designed by him to effect a strict comparison of the B. A. units of resistance deposited in the Cavendish Laboratory, Cambridge.—Prof. Perry described a "dispersion photometer" devised by him and Prof. Ayrton for comparing very strong lights with feeble ones.—Prof. Ayrton described the method employed by himself and Prof. Perry to determine the value of *g*, the co-efficient of gravitation at Tokio, Japan. They found it to be 980·06.—A spherometer designed by Mr. W. Goolden and made by Mr. Hilgar was also shown.

ROYAL SOCIETY OF LITERATURE.

DEC. 17TH.—J. Haynes, Esq., in the chair.—A paper was read by Dr. Waldstein, "On the Group of Hermes and Dionysos by Praxiteles recently discovered at Olympia," in the Heræum at that place, the existence of which has been noted by Pausanias (v. 17, 3), and stated by him to have been the work of that celebrated sculptor. In this paper Dr. Waldstein pointed out that some doubt has been cast on this assertion by some recent German critics, who were inclined to attribute the work to a grandson of Praxiteles who bore the same name. He, however, showed, by a minute criticism of the sculpture, that there was really little ground for this theory, as the artistic character of the Hermes harmonizes perfectly with that of all the monuments which have been hitherto associated with the name of the elder Praxiteles, who is believed also to have greatly influenced Lysippus in the canon of human proportion he constructed. From the *figuræ quadratæ* of Polycletus and the slim, graceful forms of Lysippus, Dr. Waldstein urged that the sculptures of Praxiteles presented the natural transition. But the Hermes was really more than a point of transition in the development of Greek sculpture—it was a type by itself, as is clearly shown by the numerous replicas we have of it. Dr. Waldstein then discussed the sad and pensive element characteristic of Praxitelian art, and accounted for this both psychologically in the sculptor himself and historically from the times in which he lived, concluding his paper with a comparison of the age and works of Pheidias as contrasted with those of Praxiteles.

NUMISMATIC SOCIETY.

DEC 18TH.—W. S. W. Vaux, Esq., V.P., in the chair.—Messrs. A Durlacher and J. W. Fowkes were elected Members.—Miss M. A. Hogg communicated a paper on a find of late Roman coins in the parish of Baconsthorpe, Norfolk; and Mr. P. Gardner two papers, one entitled "Sun-worship on Coins of Macedonia and Thrace," and the other "On the Coins of Elis." In this paper the writer attempted a chronological arrangement of the rich and beautiful series of the Elean money. He divided the history of Elis into fifteen periods, beginning about B.C. 480, and ending A.D 217. To each of these periods Mr. Gardiner assigned coins, the silver staters of the earlier periods being probably issued in greater quantities at the period of the Olympic festivities than during the intervals More care appears also to have been bestowed upon the coinage at Elis than elsewhere, and the types constantly change, facts which indicate that they were used rather in the place of issue than abroad. A curious fact mentioned by Mr. Gardiner was that during the recent German excavations of Olympia no silver staters of Elis have been discovered; the reason of this was probably that there was no city at Olympia, but only an occasional encampment.

LINNEAN SOCIETY.

DEC. 18TH.—Prof. Allman, President, in the chair.—Mr. H. Seebohm was elected a Fellow, and Messrs. A. D. Bartlett, N. E. Brown, and F. H. Waterhouse were elected Associates.—Mr. B. Dayton-Jackson exhibited a complete series of the various editions of Dillenius's "Historia Muscorum," Oxford, 1741, and its reprint, Edinburgh, 1811, in illustration of the following communication.—The Rev. J. M. Crombie read a paper "On the Lichens of Dillenius ('Historia Muscorum') as illustrated by his Herbarium." The latter collection is preserved in the Botanic Gardens at Oxford, and the specimens, though well nigh 150 years old, are still in a good state of preservation. The earlier writers on cryptogamic botany, in their synonomy and nomenclature made constant reference to his descriptions; hence the present importance of an analysis of his material, and the more so as hitherto no systematic examination has been attempted, though some old writers have compared a few forms. Notwithstanding very considerable accuracy of identification of the Dillenian lichens, yet serious mistakes have crept in; Mr. Crombie reviews the series, and gives a conspectus and technical data, adapted to the present standpoint of botany.—Prof. Allman then gave a description of what appears to be true sense organs in the Hydroids. In one form the organ in question is a bulb with rod-like structures and a series of radiating filaments. These latter terminate at their extremities in conical bodies, containing filaments which resemble thread-cells, though differing physiologically. Another form is met with in a Medusa (Gemmellaria), where free, club-tipped filaments, constantly in motion, are attached to the manubrium, and possess sacs with thread-cells, but incapable of being exerted. Prof. Allman suggests the term *podocysts* for these, and says, from his observations in Myriothela and other genera, they have a wide extension among the Hydroids.

ZOOLOGICAL SOCIETY.

DEC. 16TH.—Prof. Flower, President, in the chair.—The Secretary read a report on the additions that had been made to the Society's menagerie during November,—Mr. H. Seebohm exhibited and made remarks on a collection of Birds made by Capt. the Hon. G. C. Napier, in the valley of the Atreck,—Mr. R. G. W. Ramsay exhibited a specimen of *Pericrocotus flammeus* in an abnormal state of plumage, obtained on the Neilgherry Hills.—Mr. Sclater exhibited a small collection of birds from the island of Montserrat, West Indies, received from Mr. J. E. Sturge of that island.—Letters and papers were read: by Mr. T. J. Parker, on the intestinal spiral valve in the genus Raia: Mr. Parker showed that there were four types of valve exhibited in individuals of that genus, differing from one another in morphological characters, in the extent of absorption surface presented to the food, and in the resistance offered to the passage of food,—from the Marquis de Folin, on the Mollusca of the *Challenger* Expedition of the genera Parastrophia, Watsonia, and Cæcum,—by Prof. W. H. Flower, on the Cæcum of the Red Wolf (*Canis jubatus*),—from Mr. E. Bartlett, on the Mammals and Birds collected by Mr. Thomas Walters in South-East Betsileo, Madagascar,—by Dr A. Günther, on a new species of Dwarf Antelope, obtained by Dr. Kirk near Brava in the South Somila country: Dr. Gunther proposed for this new species the name of *Neotragus Kirki*,—from Mr. M. Jacoby, on a new species of Phytophagous Coleoptera,—from Prof. J. R. Greene, on a remarkable Medusa (*Charybdæa haplonema*) from Santa Catharina, Brazil,—by Mr. E. R. Alston, on the skull of a Chamois with four horns, which had been exhibited at a previous meeting of the Society,—and by Mr. H. Seebohm, on certain obscure species of Siberian, Indian, and Chinese Thrushes.

CHEMICAL SOCIETY.

DEC. 18TH.—Mr. Warren De La Rue, President, in the chair.—The following papers were read: "On the Specific Volume of Water of Crystallization," by Messrs. T. E. Thorpe and J. J. Watts,—"Note on the Formation of Ozone during the slow Oxidation of Phosphorus," by Mr. H. McLeod,—and "On the Analysis of Organic Bodies containing Nitrogen," by Mr. W. H. Perkin.

ENTOMOLOGICAL SOCIETY.

DEC. 3RD.—J. W. Dunning, Esq., M.A., V.P., in the chair.—Mr. Howard Vaughan exhibited a series of extreme varieties of *Lycæna corydon* which had been taken at Dover.—Mr. W. L. Distant exhibited a hitherto unrecorded variety of *Danias plexippus* (commonly known as *D. archippus*), received from Antigua.—Mr. R. S. Billups exhibited some rare British beetles, and a specimen of *Carabus auratus* taken in the Borough Market.—Mr. C. O. Waterhouse communicated some interesting details as to tenacity of life in *Curculio cleonus*.—The Rev. H. S. Gordon read a paper entitled "Materials for a Reversion of the Lampyridæ."—Mr. Bates, in connection with the light-emitting power of this family, remarked that certain species of longicorns mimicked Lampyridæ with great exactness, the light-giving segments of the latter being perfectly represented in the longicorns although destitute of phosphorescent power.—Mr. J. W. Slater communicated a paper "On certain Minute Characters of Insects with reference to the Theory of Evolution."—A communication was received from Mr. P. H. Gosse "On *Papilio Homerus*, its Ovum and Larva,"—and a paper from Mr. R. Trimen "On some hitherto Undetermined Butterflies inhabiting Southern Africa."

MICROSCOPICAL SOCIETY.

DEC. 10TH.—Dr. Beale, President, in the chair.—Ten new Fellows were elected.—The following papers were read: "On a Series of Experiments made to determine the Thermal Death-Point of known Monad Germs when the Heat is endured in a Fluid," by Mr. Dallinger,—"On the Classificatory Significance of Raphides in Hydrangia," by Mr. Gulliver,—"On a Part of the Life Cycle of *Clathrocystis æruginosa* (Kutz)," by Prof M. Duncan,—and "On a Simple Revolving Object-Holder," by Mr. W. Teesdale.

METEOROLOGICAL SOCIETY.

DEC. 17TH.—Mr. C. Graves, President, in the chair.—Messrs. T. Buckland and G. Wigner were elected Fellows.—The following papers were read: "On a Sand-Storm at Aden, July 16th, 1878," by Lieut. H. H. Russell,—"On a New Form of Hygrometer," by Mr. G. Dines: this is a modification of the hygrometer which was first described at the British Association Meeting in 1872,—"The Diurnal Range of Atmospheric Pressure," by Mr. R. Strachan,—and "Note on a curious fracture of a Solar Radiation Thermometer," by Mr. G. M. Whipple.—Mr. R. H. Scott exhibited and described a new form of sunshine recorder, which is to be used during the coming year at a considerable number of stations distributed over England.

ANTHROPOLOGICAL INSTITUTE.

DEC. 9TH.—E. B. Tylor, Esq, President, in the chair.—The President read some communications from the Rev. L. Fison and Mr. J. Forrest on Australian marriage customs, which will materially assist in clearing away the difficulties which surround this interesting subject.—In the absence of the author, the Director read a paper "On Savage and Civilized Warfare," by Mr. J. A. Farrar.—Mr. W. G. Smith exhibited a collection of sixty specimens of palæolithic implements, chiefly found in the valley of the Axe, many of them unusually large and heavy, and in an excellent state of preservation.—Four water-colour portraits of Tasmanians were exhibited, taken about forty years ago, and showing clearly all the physiognomical peculiarities of that interesting race.

NEW SHAKESPEARE.

DEC. 12TH.—Mr. Furnivall, Director, in the chair.—The first paper read was by Mr. J. W. Mills, "On the Evidence that Shakespeare was, in 'Troilus and Cressida,' rewriting an old Play." This was clear in Act v., of which only the speeches of Thersites (and perhaps a few others) were Shakespeare's. To the same cause were due the inconsistencies in the character of Cressid, her first appearing pure, then impure, then pure again; the proposal of the grave Ulysses that Cressid was to be "kiss'd in general;" the sudden springing on Achilles of the Greek's knowledge that he was in love with Priam's daughter Part of Act iv. sc. 2 could not be Shakespeare's, nor the kissing part of Act iv. sc. 5.—Mr. Furnivall read a paper, "Are the Philosophizings of Achilles in 'Troilus and Cressida,' Act iii. sc. 3, ll. 75-111, and of Aufidius in 'Coriolanus,' Act iv. sc. 7, ll. 37-55, and Lorenzo's lines on the 'patines of bright gold' in 'The Merchant of Venice,' Mistakes in Characterisation on Shakespeare's part?" Rejecting the Achilles part of "Troilus," Act v., as genuine, and noting how Shakespeare had led up to Achilles' speech in Act iv. sc. 7, and had made Ulysses echo Achilles, rather than Achilles Ulysses, Mr. Furnivall contended that the reflective speech that had been questioned was rightly put into Achilles' mouth. So Aufidius, though a Volscian, was shown capable of his Hamlet-like speech on Coriolanus's career; and Lorenzo, though he was a bit of an adventurer, was yet an Italian and a gentleman, capable of impression by the "evening air, clad in the beauty of a thousand stars," and able to give expression to his feelings.—Mr. T. Tyler spoke on *hebenon* being an anagram of *henbane*.

GEOLOGICAL SOCIETY.

DEC. 17TH.—H. C. Sorby, Esq. President, in the chair.—Messrs. J. Booth, P. N. Bose, E. S. Cobbold, D. M. F. Gaskin, J. F. Penrose, S. Seal, T. Tate, and R. Taylor were elected Fellows.—The following communications were read: "A Contribution to the Physical History of the Cretaceous Flints," by Surgeon-Major G. C. Wallich, M.D.,—and "Undescribed Fossil Carnivora from the Sivalik Hills, in the Collection of the British Museum," by Mr. P. N. Bose.

GEOGRAPHICAL SOCIETY.

JAN. 12TH—Sir Rutherford Alcock, V.P., in the chair.—The following gentlemen were elected Fellows: Capt. F. Bailey, Messrs. R. G. Bailey, R. Capper, C de T. Chamberlaine-Bey, C. J Fèret, J. Heaton, A. Hoare, P. A Holland, J. O N. James, H Le Crèn, N. Phillips, A. Riches, R. Vause, and S. Wheeler.—The papers read were, "The Grand Canal and Yellow River of China," and "Hankow to Canton Overland," by Mr. G. J. Morrison.

PHILOLOGICAL SOCIETY.

DEC. 19TH.—Dr. J. A. M Murray, President, in the chair.—The following papers were read: "*dare*, 'to give,' and *-dere*, 'to put,' in Latin," by Mr. J. P Postgate, in which the current view of *credere*, &c., being compounded with *dha* (place) was opposed, it being maintained that all these words are compounds of [illegible] (give),—and "English Etymologies, correcting some of Prof. Skeat's," Part II, by Mr. H. Nicol. The etymologies discussed were those of "affray," "attire," "badger," "breeze" (cinders), and "costive."

SOCIETY OF BIBLICAL ARCHÆOLOGY

JAN. 6TH.—Anniversary Meeting.—Dr. S. Birch, President, in the chair.—After the nomination and election of Members, &c, the Annual Report of the Secretary for the Session 1878-1879 was read.—The following Officers and Council for the current year were elected: President, Dr. S. Birch; the Right Rev. Joseph Barber Lightfoot, D.D., &c., Bishop of Durham, was added to the list of Vice-Presidents; Council, Rev. J. Angus, Rev. J. C. Ball, Rev. Canon Beechley, W. Besant, T. Christy, R Cull, R. Cust, C. D. Fortnum, Sir H. S. Giffard, C. Harrison, H. H. Howorth, Rev. A. Löwy, Prof. E. L. Lushington, J. M. Norman, Hormuzd Rassam, P. le Page Renouf, J. Sidebotham, and Prof. W. E. Wilson; Hon Treasurer, B. T. Bosanquet: Secretary, W. H. Rylands; Hon. Secretary, A. Cates; Hon. Secretary for Foreign Correspondence, Rev. A. H. Sayce; Hon. Librarian, W. Simpson.—A communication giving an account of the monuments and inscriptions on the rocks on the Nahr-el-Kelb river, Syria, by Mr. W. St. Chad Boscawen, was read by the Secretary.

INSTITUTION OF CIVIL ENGINEERS.

DEC. 23RD.—Annual General Meeting.—Mr. Bateman, F.R.S., President, in the chair.—In the report of the Council it was stated that there was no more important subject for the consideration of the members, than the question whether the objects of the society had been adequately fulfilled, and, if not, then in what way they could hereafter be more properly carried out. A succinct account was first given of the periodical meetings for the readings of papers and for the discussion of engineering topics, leading to a review of the publications of the institution, which for the past five years had comprised four volumes of "Minutes of Proceedings" annually. These volumes embraced original communications other than those read at the meetings, and also abstracts of papers either addressed to similar bodies abroad, or printed in foreign scientific or technical periodicals. During the past session these volumes—issued respectively in the months of March, May, July, and September—had together contained 1701 pages. The Minutes of Proceedings proper, including the papers read at the meetings, reports of the discussions upon them, and written remarks, embraced 885 pages, the other selected papers occupied 313 pages, the obituary notices of deceased members 80 pages, and the abstracts of memoirs contributed to foreign societies and periodicals 396 pages. Every member, whether belonging to or only attached to the institution, and wherever resident, received post free, a copy of each volume, as published. The advancement of scientific knowledge, more especially in its application to engineering, was, without doubt, materially promoted by the meetings, which afforded opportunities for the interchange of opinion among the best authorities on the topics brought forward; and the complete and rapid circulation given to the records of such meetings, supplemented as it was now by the additions described, furnished, perhaps, the most efficient plan that could be devised for the collection of information on all those many sciences upon which the successful practice of engineering depended, and for its dissemination to the many members resident in distant countries, where access to current engineering literature was difficult. The members were again urged to contribute the particulars of the mode of execution, the details of construction, and the cost of works at home, as well as to furnish short notes of useful facts and deductions acquired in the course of practice and observation The next means that might be pointed to for promoting the objects of the institution was the library. Tracing its gradual progress, it was remarked that at present the collection contained 15,500 separate volumes, besides about 120 volumes of pamphlets. The members were reminded that the advanced position of this unrivalled collection of technical literature could only be preserved unimpaired by suggesting the titles of important professional treatises not already in the library, and particularly by presenting copies of their own works and reports as published or printed. An account of the operations and condition of the institution during the past twelve months was then rendered. From this it appeared that there had been twenty-four ordinary meetings, at which sixteen papers were read and discussed, the authors of these receiving Telford premiums for their communications. Twenty-five other papers were selected for publication, and the authors of four of these had been similarly rewarded. There had also been eight students meetings, when as many papers were read, and Miller prizes had been bestowed upon four of these authors. During the year the Council were engaged in effecting the separation of the professional from the non-professional associates, in accordance with the directions of the special general meeting of the 2nd of December, 1878. The qualifications and antecedents of 1670 associates had to be separately considered, of whom 1080 had been transferred to the group of associate members, leaving a residue of 590 in the original class. The elections had comprised 1 honorary member, 40 members, and 152 associate members, besides 23 associates not entitled to the privileges of corporate membership; while 68 associates had been transferred to the class of members. On the other hand, the deductions had been, by deaths, resignations, and erasures, 71 members, associate members, and associates. There had been an addition in the twelve months of 1 honorary member, 79 members, and 65 associate members or associates, representing a total increase of 145. The gross numbers on the 30th of November last were: 17 honorary members, 1140 members, 1221 associate members, and 582 associates, making a total of 2960, irrespective of the students. This aggregate was more than double what it was twelve years ago. The student class now numbered 584, of whom 150 were admitted last session, when 42 members were elected associate members, and 24 ceased to remain on the list, so that the net increase had been 84. The statement of accounts showed that the receipts, grouped under three heads, were—from annual subscriptions and from dividends on institution investments £10,960 11s. 9d., from admission fees and life compositions £2837 12s. 6d., and from trust funds £431 13s. 5d., together £14,229 17s. 8d. On the other hand, the disbursements, similarly distributed, were—for ordinary expenditure £9826 10s. 7d. (including £4508 19s. 3d. on account of "Minutes of Proceedings"), for institution investments £4093 1s. 2d., and for trusts £530 18s. 9d., making a total of £14,450 10s. 6d. The difference between the two sides of the account was met by the bankers' balance being less by £220 12s. 10d. than it was twelve months ago. The accumulated property of the institution now amounted to £31,094 1s. 8d., the interest on which constituted rather more than one-tenth of the annual income. The nominal or par value of the trust funds, held for the purpose of awarding premiums, was £14,642 13s. 10d., the whole of which stood in Government securities. In conclusion, the belief was expressed that, both in its organisation and in its method of procedure, the Institution of Civil Engineers was distinctly and definitely dedicated to the promotion of science, that its present prosperous condition might be taken as a convincing proof of the high esteem in which it was held, and that a confident hope might therefore be entertained that its practical and useful character would be as fully and as completely maintained in the future as in the years gone by. The report having been adopted, the premiums and prizes awarded at the close of last session were presented by the President, to whom the thanks of the meeting were unanimously voted, the services of the Vice-Presidents and Council, and of the auditors being similarly acknowledged. The Scrutineers (to whom a vote of thanks was passed by acclamation) reported that the following gentlemen had been duly elected to fill the several offices of the Council for the ensuing year:—Mr. William Henry Barlow, F.R.S., President: Mr. J. Abernethy, Sir W. G. Armstrong, C.B., F.R.S., Sir J. W. Bazalgette, C.B., and Mr. J. Brunlees, Vice-Presidents; Mr. G. Berkley, Mr. F. J. Bramwell, F.R.S., Mr. G. B. Bruce, Sir John Coode, Mr. E. A. Cooper, Mr. A. Giles, M.P., Sir Charles A. Hartley, Mr. H. Hayter, Dr. W. Pole, F.R.S., Mr. R. Rawlinson, C.B., Dr. C. W. Siemens, F.R.S., Mr. D. Stevenson, Sir W. Thomson, F.R.S., Sir Joseph Whitworth, Bart., F.R.S., and Mr. E. Woods, other members of Council.

An improvement in dumping waggons has been patented by Miss Annie McFarlane, of San Bernardino, Cal. The object of the invention is to provide a cheap, simple, and convenient dumping cart or barrow that will be especially serviceable in mines.

HUNT'S GUN AND PROJECTILE FOR EFFECTING COMMUNICATION WITH WRECKED VESSELS.

The first invention of this kind which was brought practically into use (says the "Life-Boat, or Journal of the National Life-Boat Institution," an association deserving the support of everybody) was the means of saving, in the aggregate, numberless lives, and was designed by the late Captain Manby, in the early part of the present century. It consisted of a small brass mortar, from which a twenty-four-pound iron shot was thrown, with a line attached, which line, carried over a stranded vessel by the shot, was secured by the crew, who by its means were then enabled to haul on board a block having a strong but light line rove through it, both ends of the line being left in the hands of the helpers on the shore.

Those on board had then only to make the block fast to the rigging or one of the masts, for which purpose a stout rope, termed a tail, was spliced to it, and those on the land, having command of both ends of the line, were enabled to haul off a strong hawser, along which they hauled the crew one by one, or sometimes two together, to the shore in a canvas cot suspended to and traversing on the hawser.

Although rockets were subsequently adopted in lieu of the shot to carry the first line over a vessel, on account of their greater portability and longer range, in other respects the apparatus is but slightly changed, and Captain Manby is entitled to the whole credit of the original idea and of its first practical application.

The use of the rocket as a propeller or projectile for carrying the line, was first proposed by the late Mr. Dennett, of Carisbrooke, in the Isle of Wight, and his rockets were supplied for many years, jointly with the Manby apparatus, by the Board of Customs, which had then the control of the Coastguard service.

On the Coastguard, however, being transferred to the Admiralty, and the supply and management of the life-saving apparatus to the Board of Trade, under the provision of the Merchant Shipping Act of 1854, the latter Board exclusively adopted the rocket, in which a further improvement had been made by Colonel Boxer, of the Royal Artillery, whereby a considerably longer flight was obtained. That apparatus is now especially known as the English life-saving apparatus, it not having been adopted, we believe, by any foreign countries, chiefly on account of the expensive character of the rockets.

Mr. Edmund J. Hunt, of Weymouth, Massachusetts, now comes into the field, and claims for his plan certain advantages over the rocket, viz., a longer range, a truer aim, especially in a high wind; and comparative cheapness.

It is a return to Captain Manby's plan, in so far as that it is a shot discharged from a gun; but the shot, or projectile, is of very peculiar character, its chief characteristic being that it contains within it a large portion of the line to effect communication with the stranded ship, the result being—1st. That the line, not having to be dragged along its whole length from the shore, but withdrawn from the projectile during its flight, the latter is not impeded by it, and a longer range is thereby obtained. 2nd. That the projectile and line are not carried to leeward of the line of fire by the force of the wind when the latter is blowing athwart its course, a truer direction being thereby obtained.

The projectile is, in fact, a tin cylinder or tube, 20 inches long, by 3½ inches in diameter, with a solid leaden shot of the same diameter at one end, the remainder of the tube having tightly coiled within it a small but strong flax line, saturated with paraffin, and said to have a breaking strain of about three hundredweight. The projecting end of this line, when a shot is about to be fired, is knotted to another cord in a cylinder on the shore, being a supplementary line to the other, a portion of it being drawn on upon the first starting of the projectile, and any further amount required towards the close of its flight, when it has discharged all the line within it. After being discharged, the line cannot be again recoiled within the cylinder by hand, as it has to be done by a machine constructed for the purpose; but a sufficient number of the projectiles would be supplied to each station, and they could, after use, be re-filled at leisure, the cost of each discharge being under seven shillings, which is, we believe, much less than half that of a Boxer's rocket.

The weight of a projectile, ready for use, is 12½lb., that of the gun averaging about 60lb.

On the 14th March last an experimental trial of Mr. Hunt's apparatus was made at Shoeburyness by the Royal Artillery stationed there, for the information of the Board of Trade, Commander Prowse, R.N., the superintendent under that Board of the life-saving apparatus on the coasts of the United Kingdom, being present, also the colonel in command at Shoeburyness, officers of the Royal Artillery, Mr. Hunt, the inventor, and others.

The results of the trial, as regards range, certainty, and accuracy of direction, were very favourable, the range varying from 300 to more than 500 yards, according to the amount of powder-charge; whilst the direction was so good that not a single shot would have failed to throw the line over an ordinary boat, and not a single line was broken There was but little wind at the time, much to the regret of the inventor, who stated that in a high wind, either adverse or athwart, the merits of his invention would be still more apparent.

There remain, however, two points which require to be tested by actual experience before the relative advantages of the Government rocket apparatus and that of Mr. Hunt can be confidently stated, viz.:—

1st. The greater weight of the gun and its bed as compared with the rocket-tube and stand.

2nd. The comparative smallness of Mr. Hunt's lines.

At some stations portability is undoubtedly of much importance, but there are many others where it is of comparatively little, and the weight of this gun and bed, between 80lb. and 90lb., slung to a pole, could be readily carried by two men.

The smallness of the line is certainly a disadvantage, as, although it is said to bear a strain of 3cwt., being only of the thickness of an ordinary goose-quill, it would not be grasped so well by men hauling on it as would a stouter line, and would be liable to cut their hands or slip through them should a severe strain be put on it. As it is, however, in actual use by the Massachusetts Humane Society at their live-saving stations, and has been favourably reported on by it, that question will in a short time be solved, if it has not been so already. That society has handsomely presented to the National Life-Boat Institution one of Mr. Hunt's guns, with projectile and lines complete. Since, however, the Institution does not undertake the provision or management of any other life-saving material than that of the life-boats, it has no practical use for the gun, &c., which it has therefore deposited at the museum of the Royal Service Institution, Whitehall-yard, London, where it may be seen by any one taking an interest in the subject.

Mr. Benjamin F. Walters, of Norfolk, Va., has invented an improved machine for removing the stems, particles of dirt, and other adhering impurities from peanuts, and for polishing and assorting.

THE INVENTORS' INSTITUTE.

ESTABLISHED 1st MAY, 1862.

FORTNIGHTLY MEETINGS, DURING SESSION,
HELD (NOVEMBER TO MAY INCLUSIVE) AT

4, ST. MARTIN'S PLACE, TRAFALGAR SQUARE, W.C.

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PAST PRESIDENT—LORD RICHARD GROSVENOR, M.P., &c., from February, 1868, till May, 1871.

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Wood and Veneer.—J. Nyland (com.), T. H. Cobley and W. G. Gard, C. Varrot, W. Boggett.

⁂ *The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.*

The diamond making process of Mr. Hannay seems to be indicated in his paper "On the Solubility of Solids in Gases" read before the Royal Society, in which he states that during his experiments he noticed a curious re-action, viz., when a gas containing carbonated hydrogen is heated under pressure in presence of certain metals the hydrogen is attracted by the metal, and the carbon is left free. When this takes place in the presence of a stable compound containing nitrogen, the whole being near a red heat, and under thousands of atmospheric pressure, the carbon is so acted upon that the clear transparent form of the diamond is obtained.

Reviews.

BLAIR ON BUILDING MATERIALS OF OTAGO.

"The Building Materials of Otago and South New Zealand Generally." By W. N. Blair, Memb. Inst. C.E. Papers originally read at the Otago Institute. Revised and Extended. Dunedin: J. Wilkie and Co., Princes-street.

This work is an exemplar of the fact that the colonial portions of the British dominions are making great strides in regard to the development of material wealth, and that they are doing so with the assistance of scientific intelligence equal to anything that we have in operation in what may for distinction sake be termed the Home-land. Mr. Blair has, it appears, been engaged in the conduct of various public works in the colony of New Zealand, and states that during the progress of the public works under his charge, he had frequently been at a loss to know what material was best suited for the work in hand, and to what uses the local materials could be best applied. There were also frequent differences of opinions as to the identity of many articles, and continual differences as to their properties. This led him to collect and note any authentic information on the subject he met with. These notes grew into the papers originally read at the Otago Institute, and the papers have in turn expanded into the volume now published. If it is found to contribute in the slightest degree towards the development of the natural resources of the colony, he adds—"I shall be amply rewarded for any trouble it has cost me."

The work is very carefully written, and shows that the building materials to be found in the colony are quite worthy of being placed in comparison with those of Great Britain. Under various heads Mr. Blair affords detailed information as to stone, bricks, concrete, and roofing slates, and their geographical distribution; and particularises the hardstones, such as true granite, syenite, pegmatite, metamorphic rocks, volcanic and trap rocks, varieties, basalts, bluestone, greenstone, dolerite, phonolite, timarzite, breccias and trachytes; also as to freestones, bricks, and concrete, with comparison of various building materials, their strength and cost. In Section II. limes, cements, and their aggregates, are brought under notice, and analyses are given. Rich limes, poor limes, and hydraulic limes—such as those of Oamaru, Peninsula and Lower Harbour, Auckland, Taranaki, and Canterbury—receive careful consideration. Hydraulic cements, artificial cements, aggregates, and their cost are duly brought under notice. In regard to timbers, the properties of timbers, structure, growth, felling, qualities, seasoning, decay and preservation are treated of. The hard woods, such as black mapuas, turpentine, red mapua, white mapua, manuka and rata, kowhai, fuschia, broadleaf, kamai, pokakos, ribbon woods, and grass trees receive much attention, as do the soft woods. The metals, viz., iron, copper, lead, and tin are not forgotten, and the work closes with a useful index.

METCALFE ON HOT-AIR BATHS.

"Hot-Air *versus* Hot-Water Baths for the Working Classes." By Richard Metcalfe. London: National Temperance League, 337, Strand.

This sixpenny pamphlet, which is in the form of a letter to the Commissioners of Baths and Washhouses of England, under Act of Parliament, 9 and 10 Vict., cap. 74, treats of the advantages of the hot-air, or Turkish, bath, over hot-water baths, more particularly as regards working people, though parity of reasoning will shew that such baths should be much to the advantage of all classes of the community. The work contrasts the effects of the hot-water and the hot-air bath in very decided terms as the following quotation will prove:—

Warm water bathing is especially unsuited to those who are exposed to unhealthy occupation or fatigue from bodily labour. The sensation of warmth received from the heated water is grateful, I admit, but this feeling soon begins to subside with the falling temperature of the bath, and is followed by an acute sense of discomfort and chilliness, which can only be relieved by a renewed supply of hot-water. This process must be continued while the bather remains in the bath, and such repeated changes of temperature—water being the medium—are attended with discomfort, and at times unpleasant consequences.

But the great objection to the warm water bath, as adapted for general use by working men, is its relaxing effect. Instead of being tonic and bracing, and exciting feelings of cheerful and vigorous buoyancy—which is what working men require—it has a decided tendency to induce lassitude, untune the system, and render it highly susceptible to the influences of cold.

In every respect the hot-air bath produces a totally different effect. It is decidedly tonic and bracing. It elevates the spirits, and excites a pleasurable sense of exhilaration and buoyancy, while it so strongly invigorates the system, and fortifies it against the influences of cold, that bathers may leave the hot rooms, reeking with perspiration, plunge into the coldest water, or roll in snow, without the slightest apprehension of injurious consequences from a chill.

In fact, as every one knows who has indulged in the luxury of the cold plunge, after having passed through the process of the hot-air bath, the rapid transition from the extreme heat of the one to the extreme cold of the other is most enjoyable, and fraught with no danger whatever. The effect is highly tonic, and the very reverse of the fatigue and lassitude caused by warm water bathing, while there is no susceptibility to cold induced. To catch cold, indeed, is impossible, for, as Erasmus Wilson, one of the ablest writers on the subject says, "the bath properly conducted cannot give cold" In truth, it is one of the great recommendations of this form of bath as peculiarly suitable to the condition of the working man, that by no other means can the human body be so well fortified against the injurious effects of cold.

Dr. Armstrong has observed that "the fatigue from a hot-water bath is frequently fatal," while at the same time he bears his testimony that "the hot-air bath does not fatigue." Surely no more need be said in proof of the immense superiority of hot air, in comparison with warm water, as a bathing medium, for is it not self-evident that a mode of bathing that produces fatigue, relaxes the system, causes an enervating lassitude, and induces an unatural susceptibility to atmospheric changes, cannot with any semblance of reason be considered as adapted for general use, much less as calculated to prove beneficial in the case of working men?

If we now consider for a moment the contrast between hot air and water when employed for purposes of healthful recreation and cleanliness, for which bathing is resorted to by the public generally, the immeasurable advantages of hot-air will become more apparent. Both water and air act directly on the skin, but in ways essentially different, and with results equally so.

The only possible effect of a warm bath is surface cleanliness, the dead epidermis which impedes the action of the skin is only very partially, if at all, removed, the internal organs are not acted on directly or indirectly to any appreciable extent. It is evident, therefore, that such a bath is not calculated to afford much relief to the skin in the performance of its functions, the most sensible benefit derived from such a process is but the temporary sensation of surface cleanliness.

With the hot-air bath the effect is very different, the immediate action on the skin is at once stimulating and soothing. Perspiration is gently excited without bodily fatigue, and poisonous impurities are rapidly exuded through the twenty-eight miles of tubing that compose the cutaneous perspiratory system of an ordinary sized man; while simultaneously a genial exhilarating influence is diffused over the whole body.

In this way the skin is assisted in the performance of its vital functions, and the whole organism is benefited both in a medical and sanitary point of view. Not only are the apertures of the pore-tubes opened and freed from the encumbrance of dead skin, but the tubes themselves are flushed, as it were, throughout, and this highly sanitive action is materially increased by the stimulus given to the skin secretions, and it can also be further facilitated by drinking cold water copiously, for which a healthful and pleasurable desire is at the same time created

Thus the conclusion which science and experience warrant respecting the comparative merits of hot-water and hot-air baths is that for all purposes, sanative, sanitary, and recreative, hot air is incomparably superior to hot baths.

We shall not take upon ourselves the responsibility of giving an opinion on the subject of the pamphlet, but shall be content to leave the matter to the careful consideration of our readers.

WATER SUPPLY.

"Our Water Supply." A Discussion for and against the Fitness of Thames and River Water for Domestic Use London: Printed by W. Trounce, 10, Gough-square, Fleet-street. 1880.

The subject-matter of this work is of such an important character that we have much pleasure in introducing it to the notice of our readers, for we thoroughly agree with its author that the fitness of Thames and river water for domestic use, are worthy the close attention of the inhabitants of London, and the following quotation tends to show that this question is really momentous —

In spite of certificates of purity from the companies' chemists, it is a matter of history that in 1853-4, as many as three thousand four hundred and seventy-six tenants of the Southwark and Vauxhall Company—a company which then distributed water from the Thames at Battersea—were officially reported to have died of cholera; and, out of this number, Mr. John Simon, the medical officer of the then General Board of Health, reported to the President, on the 13th May, 1856, "that of the 3,476 persons, tenants of the Southwark and Vauxhall Company, who died of cholera in 1853-4, two-thirds would have escaped if their water supply had been like their neighbours; and that, of the much larger number—tenants of both the Lambeth and the Southwark and Vauxhall companies—who died in 1848-9, also two-thirds would have escaped, if the Metropolis Water Act of 1852 had but been enacted a few years earlier."

The Act of Parliament referred to was passed to prevent the companies taking water, after August, 1855, for the supply of London, from the Thames below Teddington Lock. Instead of the companies, however, resorting to those enormous supplies of pure water so readily and so cheaply to be obtained at a high level from the chalk strata surrounding London, as was strongly recommended at the time by the Government ment Commission, consisting of the late eminent Professors Graham and Miller, and Professors Hoffmann, the companies insisted upon still resorting to the river above Teddington Lock, notwithstanding it had been demonstrated before the Select Committee of the House of Commons, in 1852, by irrefutable evidence given by the promoters of the Bill of the London (Watford) Spring-water Company, that the water above Teddington Lock, though less contaminated than below the lock, was still too impure for domestic use. Yet, at the present time, as will be seen by the following correspondence, men well-informed on other subjects are to be found who, trusting to the statements of certain analytical chemists, assert that the water above Teddington Lock is quite innoxious, as, in 1849, the chairman of the two water companies above referred to declared it to be below the lock at Kew and Battersea.

For instance, Dr. Meymott Tidy, M.B., M.S., F.C.S., unhesitatingly states, in 1878, in a report addressed to the Society of Medical Officers of Health, "Although I have most diligently considered and compared the death-rates, and also, as far as possible, the causes of death, of different parts of the metropolis, supplied by the Thames water, the Lea water, and the water from the chalk wells of the Kent Company respectively, I have failed to discover any differences worth noting in the death-rates, or any evidence whatsoever that any special class of disease has been prevalent from drinking waters of the Thames and Lea, or absent from the use of the chalk water" No doubt, on similar authority (?), Sir Edmund Beckett, Bart., Q.C., leader of the Parliamentary Bar, and the retained advocate of the London water companies, did not hesitate to write to the *Times* a letter, published on the 10th of January, 1876, to the purport that those who complain of the quality of Thames water "have never traced the smallest degree of illness in London to the drinking of the water now supplied from either the Thames or the Lea"

The same wrongheadedness that characterises the avowal of the chairman of the two water companies in 1849 is found in the avowal of the learned counsel for the companies in 1876 In the weekly return of births and deaths in London and twenty-two other large towns of the United Kingdom, published by authority of the Registrar-General, for week ending Saturday, July 20th, 1878, the following revelations will be found.—"In London, the high mortality of the week is due to diarrhœa, which becomes fatal in London when the temperature of the Thames rises much above 60 deg. Thus, the Thames temperature, which had been 60 deg., rose in the last week of June to 65 deg.; in the three following weeks, it was 68 deg., 66 deg, and 67 deg The weekly deaths from diarrhœa and simple cholera, which had been 23, rose to 78, 156, 256, and 349 in the corresponding weeks. The deaths from diarrhœa are differently distributed in the fields of the water companies. Thus, the deaths in the last four weeks were 786 in the districts supplied with Thames and Lea waters, whereas the deaths in the districts supplied with water drawn from the chalk by the Kent Company were 19. Out of the same population, the deaths in the former were to the deaths in the latter as 3 to 1."

In the issue for the following week, ending July 27th, 1878, will be found—"The deaths referred to diarrhœa and simple cholera, which in the five precedings weeks had rapidly increased from 22 to 349, further rose last week to 457, of which 336 were of infants under one year of age, and 99 of children aged between one and five years." . . . . "During the past five weeks, the annual death-rate from diarrhœa within the area supplied by the Kent Water Company from deep wells in the chalk, has been equal to 1·7 per 1000; whereas, in the rest of the metropolis supplied by the other companies with water from the River Thames and Lea, the diarrhœa rate averaged 3·7 per 1000."

Notwithstanding these deplorable and frightful facts, pointed out by so competent and independent an authority as the Registrar-General, and without any consideration for the desires or wishes of the great mass of the inhabitants of London, the water consumers—who for many years past have suffered illness and premature death from being, against their will, obliged to drink polluted Thames and Lea river water—and not only so, but, as years passed on since 1854, have had to keep on paying a higher and higher monopoly price—are now threatened with a Government project to compel them to buy up for a monstrous sum, and to become the proprietors of, the existing works, whose chief value consists in the close monopoly the directors have contrived to obtain from the Legislature.

The total expenditure of the eight water companies, from their establishment up to the 30th of September, 1878, is seen in a return made by an order of the Honourable the House of Commons in the past year; in round figures it amounts to £12,100,000. Competent authorities state that, including the sum to be paid to the companies for forced (?) sale, the cost of the purchase to the ratepayers will exceed twenty-eight millions.

Should the intended purchase of these effete works take place, neither the quality of the water as now supplied, nor the mode of supply will thereby in any degree be bettered. Neither is it likely that the working expenses can be appreciably lessened by any new body that may be appointed to perform the functions of the companies, notwithstanding the totally unreliable and loudly-asserted statements to the contrary. In order to improve the mode of distribution, and to get rid of the necessity of still supplying to London the enormous volume of Thames and Lea water that the Registrar-General has reported in certain warm seasons to be infected, another large outlay, probably five or six millions, will be needed, so that, under the proposed arrangement, if the quality is to be bettered, the total cost to the consumers of water—*i.e.*, the ratepayers—is not likely to be less than from 33 to 34 million pounds sterling.

At the present time, competing works, of the best design and construction, including entirely new distributing mains and service-pipes, for the supply of all London and the suburbs served by the existing companies, could be constructed for ten millions For this sum a constant supply, at high pressure, of pure, softened spring water, derived from unpolluted subterranean sources could be had. Will the ratepayers and water consumers of London be satisfied to saddle themselves, and their posterity, with the payment of 33 or 34 more, millions, when their object can be better attained at an outlay of ten millions, or less? If not, they must bestir themselves betimes, for it is confidently stated that a Government department and the eight companies that supply London have made a compact, the latter to sell at a monopoly price, the other to get the ratepayers to purchase the existing obsolete works, and thus, for ever, saddle the ratepayers with an outlay of twenty-four millions, and, in consequence, debar competing companies from being able to to furnish London with supplies of pure, softened, spring water, on a better and more efficient system, at their own risk, at one-half the charges now enforced by all the present companies for their water, by far the larger volume of which is river water that has been unavoidably mixed with much liquid fœcal and other noxious matter, and which must, as the population increases, be ever more and more contaminated. Even now, as shown by the able and impartial returns of the Registrar-General, this water is infected in hot seasons—the very time when drinking water is in most request by young and old

Many other important characteristics of river and softened spring will be found discussed in the letters, which, it may be right to state, were originally published in the *Surrey Comet*.

For ourselves, we can only say that although the author is perpaps too hard upon the water companies whose governing bodies are doubtless composed of honourable men, yet the arguments put forward are so cogent that we think every one will do well to carefully consider them.

AURIFEROUS QUARTZ OF SOUTHERN INDIA.

"Notes of a Journey to the Auriferous Quartz Regions of Southern India, with Facts Relating Thereto." By A. HAY ANDERSON. Edinburgh and London: William Blackwood and Sons. 1880.

THE attention of newspaper readers is every now and then given to paragraphs from, or in, Indian and other papers, notices—generally short, and as generally, apparently, somewhat visionary—about quartz-reefs, gold-mining, &c. We read of wonderful reports by mining engineers and others, notices by the Madras Government, or from the Madras Government *Gazette*, with apparently wild reports as to the yield of mineral veins in one particular district of the Wynaad; of the Duke of Buckingham's visit to that district, and of his ideas of "the brilliant future" for that portion of the Presidency at least; we hear of a company to work one block of land there, and to divide with Nicol and Co.'s liquidators cent. per cent. of the vast anticipated profits (sending strong gleams of hope into the hearts of City of Glasgow Bank shareholders), and now of a second company to work on adjoining land. We are glad to be able to give some facts regarding those regions, as well as about other—and we believe richer—reefs and regions in the Mysore province, considerably further north than the Wynaad. Walking along Princes-street or along the Strand to-day, within four weeks we could be, hammer in hand, pounding a piece of quartz at a Wynaad reef or on the Colar gold-fields. The latter are the more easily got at, as, landing at Bombay, rail can at once be taken for Madras. The mail-train starts at 2 p.m. At Colar, says Mr. Hay Anderson, 40 miles from Bangalore, we get almost at once to the auriferous quartz regions—the regions where the pioneers of Indian gold-mining have been for years prospecting and working, developing slowly but surely the resources and riches of that district.

To continue in the words of our author: We confine ourselves first to a bare statement of facts, of stone actually got, reefs actually seen and prospected over, and actual results. One reef in this district has been more thoroughly tested than others: from 9 tons of stone taken out at 80 feet depth, 27½ oz. of gold were got; stone taken out at another part, and at 18 feet depth, gave at the rate of 1 oz. 3 dwt. per ton; and at 50 feet depth, 4 oz. 13 dwt. per ton. From that reef, and near the portion last tested, some 300 to 400 tons of stone are now ready waiting the arrival of stamping and amalgamating machinery from Australia. The stone is a dark-grey quartz, the gold in it is in very fine particles, and is diffused throughout. We can well imagine that within a year or two, mine after mine, and company after company, will be busy at work all over that district. Capital and machinery are essential there as well as in Wynaad.

The work proceeds with a graphic recital of the journeyings of the author, who, visiting the particular spots where mining is being done, breaking off and breaking up pieces from those reefs, and seeing the gold in it, many pieces, and all the samples shown looking far richer than the grey vein-stone of Colar. The Madras Government *Gazette* of September last gives the report of the Government mining engineer, corroborating other reports previously published. It states the results of tests of parcels of stone taken from different parts of one reef:—

Lot		oz.	dwt.	
No. 1.	No gold visible	0	11	Per ton, we omit the grains.
No. 2.	No gold visible	2	16	
No. 3.	A little gold visible	56	13	
No 4	Gold visible	204	11	

Travelling more about, and further on in the Wynaad district, many ancient workings are seen, where the stone had outcropped and gold been visible, it had always been followed down so far—all hand-labour, sinking, pounding, washing; but reef after reef has never been touched at all, all waiting exploration. The district is about 150 miles south-west of Bangalore, and due east from Calicut. Many reefs extend to, at least show, near the summit of the Ghauts, within thirty miles of the coast, and approachable from Calicut going to South Wynaad, from Tellicherry to North Wynaad. A letter, dated 31st October last, written by an associate of the Royal School of Mines, who, on account of Messrs. Nicol and Co., visited the district some eighteen months ago, says—"From the vast extent of work done by the ancients, corroborated by the fact that the surrounding jungles to this day contain wild elephants, apes, and peacocks, also aromatic trees and plants, I had no hesitation in designating this locality as the veritable 'Ophir' of Scripture . . . I am more strongly impressed with that view than ever."

We have to omit the various incidents of travel narrated in this pamphlet, which concludes as follows:—It had been ascertained three or four years ago—stories and accounts heard years before that, at first partaking of the legendary and indefinite, then with more substantiality as more was heard and known, and visits were paid to the districts—how much had long since been done, and how much may, and can, now be done with regard to these quartz regions and gold-bearing reefs; and now, during these three or four years, more and more work has been done, reefs have been traced and examined, the country demarcated, plans made, leases (as well as grants) been obtained from Government, arrangements completed with landowners and landholders (a complicated and not an easy matter), and reports on the quartz have been got in India, in Australia, and at home. We had now satisfied ourselves that gold is there, and is obtainable with even less difficulty and at less cost than at the Australian and Californian mines; and not only that, but that it is there in no mean or meagre quantity. We next proceeded to see the ground, and the one reef in particular, which traverses that portion of the land longitudinally, running nearly due north and south for over three miles.

To go from the traveller's or visitor's account to the geologist's.—The reef in question curves here and there, and dips from east to west, and is intersected frequently by spurs of quartz diverging from the main reef or its different veins. The underlying strata of schist rests on trap-rock. The quartz is mostly of a grey granitic appearance, though in some places it is white, partly discoloured with iron, but deeper down again assuming the grey and hornblende appearance.

To go on and blend that geology with further facts. At one place near a small outcrop from the reef in question a shaft was sunk, and at about 50 feet depth a small drive made, from which over nine tons of qurrtz were taken, some of the stone with gold visible in it, some with no appearance of gold at all. Pounding and amalgamating machinery had been erected, and from these nine tons of stone 27½ oz. of gold were obtained, as previously stated. Further on, however, another shaft had been sunk, the reef tapped, and the stone reported "barren;" water in quantity was come upon in the "drive" first mentioned, large capital seemed necessary, and for a time work was suspended. Now work has been resumed, and is being energetically and successfully proceeded with. The stone declared worthless has been found quite the reverse; natives had soon carried most of it away or broken it up on the spot, and it actually contained gold to over an ounce per ton. More stone from an adjacent part of the reef has been got up and tested; and, still further to prove matters, at 15 and 30 feet further on two fresh shafts have been sunk, the one 18 the other 50 feet deep; and the stone tested at the office of Mr. Brough Smyth, the eminent mineralogist from Australia, now employed by the Government of India specially to aid with these and similar discoveries, was found to contain gold in quantity such as would realise the wildest ideas of quartz-miners. The reef has just been laid bare 100 feet longitudinally, and quartz is being quarried out: it commences at a thickness of 7 feet, and at the foot of the present working is 12 feet thick. It is estimated by high mining authorities that, supposing that one reef to extend to the depth of only 300 feet, to work it so as to obtain—*i.e.*, raise—100 tons per day, it would last for over sixty years. (*Mem.*—In Australia we had seen sinking on reefs, rather with the reefs, to depth of 1000 feet, and know of sinkings, both there and in California, of over 1500 feet.) In this stone the gold is throughout, and even when invisible with a magnifying-glass, no veinstone tested has as yet yielded so low a return as half an ounce per ton. Diggers know what that means, for six pennyweights to the ton clears all cost and leaves a profit.

All the accounts received on the spot and elsewhere, all the geological and other facts here roughly narrated or sketched out are the mere etchings, in pencil as it were, for a landscape in a setting of gold, which will yet materially affect the currency question, and go very far towards settling matters with regard to our Indian exchanges.

An article in the *Gentleman's Magazine* for January, 1880, goes fully into the question as to where the gold of Ophir traditions—came from, exhausting the historical and other facts, it agrees with the view as given above in extract from letter, and concludes: "It is no idle surmise, but an assumed inference ascertained by an accumulation of facts, that the mines which in former times enriched India with an unparalleled supply of gold, will ere long pour forth a fresh supply. The result, it cannot be doubted, will be to restore our great empire in the East to that flourishing condition which seems of late to have been almost despaired of."

Those who wish further and detailed information on this important subject are requested to apply to 31, St Bernard's Crescent, Edinburgh, or 11, Hillsborough Square, Glasgow.

ANDERSON ON LIGHTNING CONDUCTORS.

"Lightning Conductors, their History, Nature, and Mode of Application." By Richard Anderson, F.C.S., F.G.S., Member of the Society of Telegraph Engineers. With numerous Illustrations. London: E. and F. N. Spon, 46, Charing-cross; New York, 446, Broome-street.

This is a very elaborate work containing all that need be said about Lightning Conductors. The author, in the preface, thus sets forth the nature and object of the work:—

Though there are English works bearing more or less on lightning protection yet it will be found these books are either obsolete and out of date, or are written in a purely popular style that conveys little or no usable information whereby may be obtained a trustworthy account of the growth and application of the Lightning Conductor.

It is with a view of meeting this need that the present work has been written. It contains not only a history of the various methods that have been used to this end, but also a thoroughly practical exposition of the systems employed by the best authorities in various countries.

To architects, clergymen, municipal officials, and all those in charge of large and lofty buildings, it would be impossible to over-estimate the importance of this subject. Year by year an enormous amount of property is destroyed merely because the simplest precautions have not been taken to guard churches and other large buildings from the effects of thunderstorms.

The author of this work can at all events claim a large practical acquaintance with its subject. He feels convinced that those concerned in the preservation of buildings, whether they be houses, churches, or public offices, need only to learn the simple methods that can be used to render the action of lightning innocuous, in order to adopt them.

The book is divided into chapters, which treat the following as principal points:—Electricity and lightning; discovery of the lightning conductor; early experiments with lightning conductors; metals as conductors of electricity; character of lightning and of thunderstorms; inquiries into lightning protection; the best material for conductors; Newall's system of protecting buildings; accidents and fatalities from lightning; the earth connection; and inspection of lightning conductors.

IRON AND STEEL AT LOW TEMPERATURES.

By Mr. John James Webster, Assoc. M. Inst. C.E.

The first part of this paper, which was read at a recent meeting of the Institution of Civil Engineers, Mr. W. H. Barlow, F.R.S., President, in the chair, treated of the generally received opinion as to the condition of iron and steel at low temperatures, reference being made to the evidence given before the Royal Commission appointed to inquire into the application of iron to railway structures, and to papers read before the British Association and elsewhere. An account followed of the results of experiments by the late Sir W. Fairbairn; after which the elaborate series by M. Knut Styffe were mentioned, and the conclusions he arrived at were stated *in extenso*. From the results of these tests as to tensile strains, it appeared that the absolute strength of iron or steel was not influenced by severe cold, but that the ductility of these materials was increased. Mr. C. P. Sandberg had submitted rails of iron and of steel to a force of impact, and his deductions were quoted.

The author then gave an account of the experiments he had made on bars of wrought iron, cast iron, malleable cast iron, Bessemer steel, and best cast tool steel, with a description of the apparatus used, and of the method of conducting the experiments. The bars were tested with tensile and transverse strains, and also by impact; one half of them at a temperature of 50° Fahrenheit, and the other half at 5° Fahrenheit. The lower temperature was obtained by placing the bars in a freezing mixture, care being taken to keep the bars covered with it during the whole time of the experiments. The results were given in eight tables, and the averages of all in a ninth table. Three sheets of diagrams accompanied the paper; the first sheet illustrated the testing apparatus, the second and third sheets showed the extensions of the bars at the different portions of their length, the appearance of the fracture, and the percentage of elongation and of reduction of area. The results of the experiments were summarised as follows, viz.:—

1. When bars of wrought iron or steel were submitted to a tensile strain and broken, their strength was not affected by severe cold (5° Fahrenheit), but their ductility was increased about 1 per cent. in iron and 3 per cent. in steel.

2. When bars of cast iron were submitted to a transverse strain at a low temperature, their strength was diminished about 3 per cent. and their flexibility about 16 per cent.

3. When bars of wrought iron, malleable cast iron, steel and ordinary cast iron, were subjected to impact at a temperature of 5° Fahrenheit, the force required to break them, and the extent of their flexibity were reduced as follows, viz.:—

	Reduction of force of impact per cent.	Reduction of flexibility per cent
Wrought iron .	about 3	about 18
Steel (best cast tool) .	„ 3½	„ 17
Malleable cast iron ..	„ 4½	„ 15
Cast iron	„ 21	not taken.

The paper closed with a review of the experiments described, with some remarks on the conclusions arrived at, and with a statement of the opinions formed by different authorities.

A case of samples of the fractured ends of the bars used in the experiments was exhibited.

MOVABLE DAMS IN INDIAN WEIRS.

By R. B. Buckley, Assoc. M. Inst. C.E.

This paper, read at a recent meeting of the Institution of Civil Engineers, commenced with a brief description of Indian weirs, and then proceeded to show the necessity for having portions of these weirs movable, so that the silt and deposits of different kinds might be swept away from the heads of the canals supplied from the rivers above the weirs. A description was given of the form of movable weir which had been adopted on the Mahanuddee and Cossye rivers. The shutters were hinged to a horizontal axis on the floor of the sluice in two rows placed back to back. The upper ones folded up stream and the lower ones folded down stream. The back or down-stream shutters were about 18 inches higher than the front row. When the movable dam was open and the water flowing over it, the front or up-stream shutters were held by hooks to the floor, so that they could not rise. To close the sluices the hooks were released by a bar, which could be manipulated from the pier; the shutters were at the same time slightly lifted by the same bar, and when the stream got under them they were forced upright. Chains, which were attached to the front of the shutters, received the severe blow which was brought on them by the sudden raising of the shutters. The back shutters, as soon as the front ones had been lifted, were raised by hand from the back, and were retained in position by wrought-iron struts behind them. When all the back shutters were up, the lower ones were pushed down on to the floor and fastened with the hooks, and the movable dam was then ready to be opened at any moment. To open the movable dam, the struts of the back shutters were released from the cast-iron shoes in which they rested, by the action of a horizontal bar which lay on the floor. This bar caught the struts one after another, as it was moved by gearing on the pier, and released them; the shutter then fell and the waterway of the sluice was opened.

On the Sone weir the movable part was in three lengths—one at each end, and one at the centre of the weir. Each length consisted of twenty-two shutters, 20 feet 7 inches long by 9 feet inches high. There were two shutters, the front and the back one, between stone piers, the front shutter was hinged horizontally at its heel to the floor. It folded forward—or up stream—into a nearly horizontal position on the floor. Each shutter had on its down-stream side six hydraulic brakes. These impeded the closing of the shutter, and prevented the shock which was so objectionable in the form of movable dam previously described. The brakes were simply formed of a pipe which was hinged to the shutter, and a strut hinged to the floor, the head of which was fitted with hydraulic packing. When the front shutter was lying horizontally the pipe became full of water from the river. In the pipe were three holes 3-16th inch in diameter, through which the water was expelled as the shutter rose. The back shutter was hinged by tension rods on its up-stream face. The rods were hinged at one end to the shutters a few inches below the centre of pressure of the water on the shutter when erect; the other extremities of the rods were hinged in the floor between the two shutters. The shutters, when the water was level with their crests, were on the point of overturning, as they were hinged slightly below their centre of pressure. When the water rose a little above their crests, they did overturn. Chains to prevent them doing so were fitted with let-go gear. As a rule, the back shutters were kept up to retain the water, the front ones being fastened down to the floor. If a flood was expected, the chains of the back shutters were let go, and when the river had risen to a certain height, they opened of their own accord. To close the movable dam, the front shutters were one by one slightly raised by hooks worked by levers from the piers. The stream then impinged below the shutters, and forced them up into the vertical position. The hydraulic brakes decreased the velocity with which the shutter would ascend, and relieved the piers and masonry from shock. When the front shutters had been raised, the back ones were pulled up by hand, and the front ones were put back into their horizontal position on the floor. Some improvements in this form of weir were suggested. As the action of the movable dams of the Sone weir had not been found sufficiently powerful to keep a channel clear for navigation, a row of shutters, similar in principle to the back shutters, but only 2 feet 3 inches high, was to be placed all along the crest of the weirs, which were 2⅓ miles long. The paper described briefly a system of double-tumbler shutters, which had been proposed by Mr. Fouracres, who introduced the system of the Sone weir, but which had not been as yet adopted in practice.

SONG

I ask not a thought in your bright days of gladness.
I ask not a glance from your path on my sadness
Yet let the past fire of my influence rest
On the heart which once craved to be clasped to my breast

Let your love be all mine in the pure world of sleep,
And my soul shall know peace at last ceasing to weep,
Nor grieve when the angel of dreams shall declare
Such rupture must wake to life's blankest despair.

V Gonville.

An improvement in plates for holding screw-cutting dies has been patented by Mr. John G. Geiser, of Fort Clark, Brackettville, Texas. This invention relates to hand plates for holding screw cutting taps and dies. It consists in certain novel features by which screw threads may be more conveniently cut than heretofore, and whereby left hand taps may be formed from blanks by right hand screw-cutting devices.

THE LAW OF COMPENSATION.

Outside the gate of Dives' house,
Upon the hard, cold ground
Lay Lazarus, the leper poor,
His couch a grassy mound
He listened to the joyous songs
And strains of minstrelsy,
For through the air were wafted wide
The sounds of revelry.

Compassion filled his heart for those
Within the palace walls,
For when, thought he, would they attain
The everlasting halls?
Thus quietly he passed his days
In patience at the gate,
Preparing for the change to come
To end his weary fate

For though he was by Dives seen
Suppliant for relief,
Yet not a thought the rich man gave
To soothe another's grief.
At length the days of mourning ceased;
The leper passed away
To where the presence of the Lord
Creates eternal day.

. . . . . .

While safe in Abram's bosom laid
The rich man he beheld,
Whose narrow, earth-bound soul in chains
Of discipline was quelled
Then spake he out to Abraham,
"Send Lazarus, I pray,
To cool this ceaseless agony,
Whose cause is need of day

For all is darkness in this place,
And everything is night;"
(For such are vice and wickedness
Compared to in God's sight).
Then spake the guide of Lazarus
In accents firm yet kind:
"Thou, Dives, when on earth, wast rich
In all that earth could find.

But Lazarus—poor, wretched, lame—
Thou didst not clothe or feed,
Nor didst thou visit in thy life
Those in distress and need.
And now he who in tears that sowed
Shall reap in peace and joy;
Thou also retribution hast
Which nothing can alloy!"

A. B.

SAHLSTROM ISINGLASS.

This invention is to manufacture isinglass, gelatine, and glue from fish offal.

The fish or fish parts are first soaked well in water, they are then left some three or four hours in a water solution of chloride of lime (say 16 of water to 1 of chloride of lime); the material is then rinsed and treated for about 20 or 30 minutes with a solution of about 300 parts water and 1 part of supermanganate of alkali; it is then exposed to the action of nitrous acid vapours generated through heating of about a quarter cubic foot of concentrated nitric acid for every hundred-weight of material.

The sulphurous acid may be first absorbed by the water as is used in the manufacture of sugar for purifying the syrup. The material is then rinsed, and all skin parts are removed which are to be made into isinglass, the rest is dried with a slow heat and pressed.

The parts destined for gelatine and glue are for a space of about 10 or 12 hours exposed to a temperature of about 100° or 120° F.; most of it is then small and is strained, after standing some hours it is dried as ordinary gelatine and glue.

Instead of the nitrous acid sulphurous acid may be used, which is generated by burning about half a pound of sulphur for every hundred-weight of material.

Mr. James W. Smith, of South Schroon, N.Y., has patented an improved washing machine, which is so constructed as to wash the clothes quickly and thoroughly, and to allow any desired part of the clothes to be ubbed more or less as may be required.

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THE INVENTOR'S INSTITUTE,

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Past Presidents :

SIR DAVID BREWSTER, K.H., LL.D., F.R.S., &c., from the establishment of the INVENTORS' INSTITUTE, till his decease, February, 1868. LORD RICHARD GROSVENOR, M.P.

President, SIR ANTONIO BRADY

THE SESSION 1879—1880

Members' Meetings will be held at 8.15 p.m. on Thursdays, March 11th and 25th; April 8th and 22nd; May 6th; and June 3rd.

On the 11th March, Patent Law Reform Conference.

On 25th March, Exposition of Inventions, and Patent Law Question.

Executive Council Meetings at 7.30, on same evenings as above.

Annual General Meeting, Thursday, May 20th, at 4 p.m., unless otherwise arranged.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

Proceedings of the Institute.

MEMBERS' MEETINGS.

On the 5th February the Patent Law question with reference to proceedings to be taken in the new Session of Parliament, was discussed; but as this was the advent of the new Parliamentary Session, the further consideration of the question was adjourned.

On the 26th February, Mr. James Cadett's paper on "Brilliancy in Lighting, with special reference to the Lime-light, was read and discussed. It was well received by a large meeting; but, in consequence of its being delivered so near the time of our going to press, we have to reserve our report of this meeting.

EXECUTIVE COUNCIL.

At the meeting on 26th February, the resolution as to a special subscription list to meet the expenses of movements to advance Patent Law Reform and other important business of the Institute, was affirmed. The financial position of the Institute was reported as progressive, and after the secretary had stated that Mr. Anderson, M.P., proposed to bring in a Bill for amending the Patent Law similar to that presented to the Legislature last Session, Admiral Selwyn remarked that International Patent Law being now so nearly approached, it would seem undesirable to take up the lesser question; but upon the matter being discussed, it was in effect agreed that it might be desirable to support Mr. Anderson's Bill.

Monthly Notices.

Mr. Crookes, F.R.S., has been awarded an extraordinary prize of 3000 francs by the French Academie des Sciences in recognition of his recent discoveries in molecular physics and radiant matter.

Balmain's "Luminous Paint" has been, we are informed, examined by the Lords of the Admiralty, who are so favourably impressed with it that they have ordered two compartments of H.M.S. *Comus* to be painted with it. At the West India Docks the Superintendent has ordered some phosphorescent lanterns for use in the spirit vaults. We have heard of other applications, but these have not been satisfactory to us, seeing that to render the paint luminous in the dark it must be previously exposed to sunshine or, at all events, to strong daylight.—*Athenæum.*

Mr. Peter Spence gave an important piece of information to the members of the Manchester Geological Society at a recent meeting. He stated that no boiler on his works had been chipped for the last fifteen years. This was simply due to his keeping the water supplied to the boilers alkaline by adding from time to time a little carbonate of soda or soda ash.

Mr. Edward Hearle Rodd died at Penzance on the 25th of January. This amiable gentleman and industrious naturalist, says the *Athenæum*, and we endorse this, cannot be allowed to pass away without some notice. Actively engaged as a partner in one of the most important legal firms in Cornwall, he still found opportunities for making a most valuable ornithological collection. For many years Mr. Rodd was a constant contributor to the pages of Newman's *Zoologist*, and his name will be frequently met with in the volumes of Yarrell and Gould. In 1864 he published a "List of British Birds in the Land's End District." At the time of his decease Mr. Rodd had in the res a work on the birds of Cornwall, which will shortly be published by Messrs. Trübner & Co. The volume will be edited by Mr. J. E. Harting, and will contain a memoir and portrait of the author from a recent photograph. Apart from its value as a guide to the ornithology of Cornwall, the addition of the memoir and portrait should make it an acceptable souvenir to the author's numerous friends.

Prof. Forbes' instrument for detecting fire-damp and determining the quantity of light carburetted hydrogen in the air was described by him at a recent meeting of the Glasgow Philosophical Society. It is called the "damposcope." The construction of it is very simple. Over the mouth of a straight brass tube is fixed a tuning-fork; inside this brass tube slides another tube of the same metal, moved by a regulating screw, so that the compound tube can be lengthened or shortened at will, this movement being registered on a dial. To ascertain the amount of fire damp in the pit, the instrument is taken to the suspected spot, the tuning fork is set vibrating, and the screw turned until the maximum sound is emitted. The index is then read off, and it appears the quantity of gas can be determined to within one half per cent.

The virulent maladies of fowls are described by M. Pasteur in the *Comptes Rendus* of the Academy of Sciences for February 9th. He states that the cholera of fowls may be prevented from becoming fatal by inoculation. M. Pasteur suggests that we should seek the destruction of phylloxera by inoculation of the vine with some microscopic fungus, and he invites the attention of naturalists and others interested in the cultivation of the vine to the subject.

M. Sainte-Claire Deville has resigned the Professorship of Chemistry at the Ecole Normale de Paris, after having occupied that chair for twenty-nine years. Prof. Troost has been appointed his successor.

Dr. Fleming, formerly of Manchester, has just died at his residence in Cheshire at the age of eighty-one. He was one of the most active promoters of the Chetham Society when it was instituted in Manchester in 1843. He was the first Honorary Secretary of the Society, and did much to promote its success. The annual meeting of the Chetham Society is fixed for Wednesday next, March 3rd, at the Chetham Library, Manchester.

The use of the telephone is becoming general. The Corporation of Leeds have formed a telephonic communication between the Town Hall and the waterworks reservoir at Eccup, and between the central gasworks in Meadow Lane, Leeds, and the branch works at New Wortley. It is stated that four hundred telephones have been supplied to the Lancashire and Yorkshire Railway.

The Scientific Review

MARCH, 1880.

DIAMOND MAKING.

Already having the distinguished honour of being associated with the name of James Watt, the inventor of the steam engine of to-day, Glasgow, is, it would seem, determined to be again to the front in the ranks of practical science; and this time the cause of renown is not a grand achievement in physics and mechanics, but a triumph for chemical science. This time it is not a creation of power by what may by way of analogy be called an analytical feat—turning water into effective vapour—but a synthetical one, turning some beggarly elementary constituent into splendid diamonds.

In our last number we noticed the efforts of Mr. Mactear, of Glasgow, to manufacture diamonds, which, it appeared, after strict investigation, were found to have no such splendid result, as Mr. Mactear had not made diamonds at all. Since Mr. Mactear's attempt another distinguished chemist of Glasgow, Mr. Ballantine Hannay, has submitted to Professor Story-Maskelyne "small crystallised particles," made from carbon in his laboratory, as to which the Professor thus writes in the *Times*:—

> Sir,—A few weeks since I had to proclaim the failure of one attempt to produce the diamond in a chemical laboratory. To-day I ask a little space in one of your columns in order to announce the entire success of such an attempt by another Glasgow gentleman.
>
> That gentleman is Mr. J. Ballantine Hannay, of Woodbourne, Helensburgh, and Sword-street, Glasgow, a Fellow of the Chemical Society of London, who has to-day sent me some small crystallised particles presenting exactly the appearance of fragments of a broken diamond.
>
> In lustre, in a certain lamellar structure on the surfaces of cleavage, in refractive power, they accorded so closely with that mineral that it seemed hardly rash to proclaim them even at first sight to be diamond. And they satisfy the characteristic tests of that substance. Like the diamond, they are nearly inert in polarised light, and their hardness is such that they easily scored deep grooves in a polished surface of sapphire, which the diamond alone can do. I was able to measure the angle between the cleavage faces of one of them, notwithstanding that the image from one face was too incomplete for a very accurate result. But the mean of the angles so measured on the goniometer was 70deg. 29min., the correct angle on a crystal of the diamond being 70deg. 31·7min. Finally, one of the particles, ignited on a foil of platinum, glowed and gradually disappeared exactly as mineral diamond would do.
>
> There is no doubt whatever that Mr. Hannay has succeeded in solving this problem and removing from the science of chemistry an opprobrium so long adhering to it; for, whereas the larger part of the great volume recording the triumphs of that science is occupied by the chemistry of carbon, this element has never been crystallised by man till Mr. Hannay achieved the triumph which I have the pleasure of recording to-day. His process for effecting this transmutation, hardly less momentous to the arts than to the possessors of a wealth of jewelry, is on the eve of being announced to the Royal Society.—I am, Sir, your obedient servant, N. Story-Maskelyne.
>
> Mineral Department, British Museum, Feb. 19.

The Royal Society have since the date of Professor Maskelyne's report had this subject under consideration, and nothing seems to have transpired to negative Mr. Hannay's success.

The social, commercial, and industrial effects of the manufacture of diamonds has much exercised the minds of the writers of the public journals, and the *Daily Telegraph*—which, whatever views one may have as to the soundness of its political knowledge, is, without doubt, from its connexions and taste, quite capable of dealing effectively with such subject matter as diamonds and precious stones,—begins a leading article by asking whether the making of diamonds out of charcoal is to be taken as good or evil news? If (says our contemporary) the statement may be believed, and we must certainly reserve our own opinion for the present, thousands of proud possessors of this hitherto unmatched gem have cause to tremble. The bride will glance at the dancing splendours of her marriage gift with tears of wounded pride; the débutante, arming herself for Court in the old family jewels, will feel half her glory vanished; the digger at the diamond fields will mutter savage things about modern science, and dealers from Cape Town to Amsterdam will anathematise chemistry. It is true that the owners and wearers of valuable diamonds may find a considerable crumb of comfort in the fact that Mr. Ballantine Hannay has produced as yet only "small crystallised particles." Perhaps this is his limit; perhaps Nature permits her inquisitive children to play with diamond dust, but still defies them to turn out a Koh-i-noor under less time than a cycle of ages, and with slighter forces than subterranean furnaces and the mighty alembics of the earthquake and the volcano. Still, if only the thing can be effected at all there is no certainty that big stones may not be manufactured by the same process as little ones, and in that case, what a dethronement there will be of the Royal jewels which, now in a hundred capitals, glitter in regalias, and make the pomp and pride of Sovereigns! Is the "Mountain of Light" which her Majesty inherits from the Great Mogul to become the shawl-pin of a milkmaid? Is the sumptuous Braganza diamond of the Emperor of Brazil to save itself only by being declared a white topaz? The Rajah of Mattan owns a stone, oval-shaped and as big as a crow's egg, for which the Governor of Borneo once offered half a million dollars, two war ships, twenty cannon, and any amount of ammunition. The Malays believe that all diseases are cured by drinking water in which this superb gem has been dipped; but what will happen when the little realm learns that its treasure is charcoal and can be excelled out of the end of a burned stick? The Czar has the Orloff diamond, once the eye of an Indian god, and valued at five million roubles, which, if Glasgow can turn out brilliants by the bushel, will not be worth as many copecks. Then there is the Regent stone, which forms the boast of the French regalia, and which was shortly to have been sold in conformity with the decrees of Republican economy. It decorated the sword hilt of the First Napoleon, and stood unrivalled in the whole world for limpidity, flashing radiance, and symmetry. Is it to be eclipsed on a sudden by artificial gems produced by the dozen or the score? The Sanci diamond, which cost the life of Henry III.'s faithful messenger, who swallowed it, and made his dead body its casket; the beautiful blue diamond in the Hope family; the magnificent jewels treasured at the native Indian courts, some of them of wondrous dimensions, and still uncut, for the European lapidaries did not know this art until Van Berguen, of Bruges, learned it from Oriental workers.

If, however, chemistry has really effected this prodigious feat, the world at large will no doubt finally benefit. Beautiful ornaments will be made general, and the demoralising shams known as "paste" and "imitation brilliants" be thrust aside. Diamond dust—one of the most useful commodities of the workshop—will become cheap; and diamond-drills, with which all sorts of excavation and mining work can be easily performed, might be universally employed. Even if the upshot of the discovery should only be that our laboratories could produce the small and inferior gems called "Bort" [and a letter from Mr. Hannay, inserted in the *Times*, of the 1st of March, which we give in another column of the Scientific Review, claims success only to this extent], it would be of extreme advantage to procure these for the arts, cheaply and plentifully. Bad for opulent beauty and for the Transvaal diggers, the feat to-day, perhaps, too confidently proclaimed, would be a good thing for trade and manufacture, and disconsolate loveliness might still find refuge in the sapphire, the topaz, and the ruby, the emerald, which science has not yet attacked. Opals are unlucky, and pearls only become certain complexions; but if diamonds ever should indeed grow unfashionable by over supply, there are untouched treasures in the mineral world, such as moonstone and the lovely labradorite. Yet the doubt would then most seriously arise where these audacities of chemistry are to stop. Sated with the creation of old and new organic substances, what if our modern magicians should press forward another step and produce gold? The experiments of Mr. Norman Lockyer go far to show that the idea of primary substances is fallacious, and that matter is practically one under many forms. What if the dream of the old alchemists should some fine day be realised, and some reckless experimentalist should as suddenly announce the transmutation of metals?

Proceedings of Societies.

ROYAL SOCIETY.

Jan. 15th.—The President in the chair.—The following papers were read:—"On Chemical Repulsion," by Dr. E. J. Mills, "Results of an Inquiry into the Periodicity of Rainfall," by Mr. G. M Whipple; "On the Spectra of Magnesium and Lithium," by Profs. Liveing and Dewar, and "Studies on the Electric Arc," by Prof. Dewar.

Jan. 22nd—The president in the chair. The following papers were read:—"On Certain Definite Integrals, Nos VI. and VII.," by Mr. W. H. L. Russell; "On the Construction of a Glycerine Barometer," by Mr J. B. Jordan; and "On a Possible Mode of detecting a Motion of the Solar System through the Luminiferous Ether," letter by the late J. C Maxwell.

Jan. 29th.—The president in the chair. The following papers were read:—"English Reproduction Tables," by Dr W Farr, "A Note on Protagon," by Prof. Gamgee; "The Induction of Electric Currents in Infinite Plates and Spherical Shells," by Prof. C. Niven; and "On the Physical Constants of Liquid Hydrochloric Acid," by Mr G. Ansdell.

GEOLOGICAL SOCIETY.

Jan. 7th.—H. C Sorby, Esq., President, in the chair.—Mr. E. B. Poulton was elected a Fellow; and Prof. A. E. Nordenskiold, Stockholm, and Prof. F Zirkel, Leipzig, foreign members The following communications were read: "On the Portland Rocks of England," by the Rev. J. F. Blake; and "On the Correlation of the Drift-deposits of the North-West of England with those of the Midland and Eastern Counties," by Mr. D. Mackintosh

Jan. 21st.—H C. Sorby, Esq., president, in the chair. Mr R. Bell was elected a Fellow. The following communications were read:—"On the Genus Pleuracanthus, Agass., including the Genera Orthacanthus, Agass, and Goldf., Diplodus. Agass., and Xenacanthus. Beyr," by Mr. J. W. Davis; "On the Schistose Volcanic Rocks occurring on the West of Dartmoor, with some Notes on the Structure of the Brent-Tor Volcano," by Mr. F. Rutley; and "On Mammalian Remains and Tree-trunks in Quaternary Sands at Reading," by Mr. E. B. Poulton.

SOCIETY OF ANTIQUARIES

Jan. 8th.—The appointment of E. Freshfield, Esq., as Vice-President, in the room of Lord Northesk, resigned, was laid before the meeting. Mr. C. Knight Watson, Secretary, stated he had been instructed by the Council to submit to the meeting, for the information of the society, the following letter from the Foreign Office, in reply to a memorial from the President and Council relating to St. Mark's, Venice —

"Foreign Office, Dec 5, 1879

"My Lord,—I am directed by the Marquis of Salisbury to acknowledge the receipt of your lordship's letter of the 25th ult, in which, as President of the Society of Antiquaries, you call Lord Salisbury's attention to the reported intentions of the Italian Government to restore the west front, or façade, of St. Mark's Venice, and request that his lordship will, through her Majesty's Ambassador at Rome, communicate to the Italian Government the desire of the Society of Antiquaries to be favoured with an authoritative statement of the real facts of the case. I am now to request that your lordship will express to the Council of the Society Lord Salisbury's regret that he is unable to accede to their wishes in this matter, as, upon a due consideration of their request, he cannot but feel that the subject is not one on which her Majesty's Government could with propriety address the Italian Government.—I am, my lord, your lordship's most obedient humble servant,

(Signed) "Tenterden."

The following letter from Lord Carnarvon to the Secretary, date Pixton Park, December 7th, 1879, was also read:—

"Dear Mr. Watson,—I return the official answer. My impression is, looking to all the circumstances of the case, that it should be read to the Council, and that, if they think it desirable, it should be read to the following ordinary meeting. I do not think that we should do more than this One great object is gained, and this should be brought out on the face of our minutes: that we sought for information, conveying as civil a protest as we could thereby against the proposed injury to St. Mark's; that we sought it in the proper manner, through our Foreign Minister, but that, as he declines to give us any help, we cannot with advantage or self-respect go further. We have discharged our duty, and the responsibility, whatever it is, rests on him. It is quite plain that the Italians and the Italian Government are not in a mood to receive well any representations from us, and therefore I see no use in forcing them on them. In laying the letter before the Council it may, perhaps, be desirable to read them what I have now written—Believe my yours sincerely,

"Carnarvon"

The following resolution of Council (December 16, 1879) was then laid before the meeting —

"The Council concur with Lord Carnarvon in thinking that no useful purpose would be served by pursuing any further the question of St. Mark's The Council feel that they have done their duty in the matter as temperately and courteously as the circumstances demanded, and if their efforts have proved abortive they feel the responsibility, as Lord Carnarvon observes, does not rest with them."

The Secretary further stated that he had been instructed by the Council to lay before the meeting the following letter from the Lords Commissioners of her Majesty's Treasury, dated December 13th, 1879, together with the reply thereto from the Council, dated December 17th, 1879. –

"Treasury Chambers, Dec. 13, 1879.

"Sir,—I am directed by the Lords Commissioners of her Majesty's Treasury to acknowledge the receipt of your letter of the 28th ult., forwarding, by the desire of the Earl of Carnarvon, a memorial from the President and Council of the Society of Antiquaries of London, in which the attention of my lords is called to the serious inconvenience and difficulties experienced by historical inquirers in consequence of the virtual inaccessibility of a large series of national and other records, and in which it is prayed that an annual grant of £2,000 may be made, at a convenient opportunity, from the public expenditure, to be expended, under the responsibility of the Society of Antiquaries, on the publication of national records not provided for by existing grants. I am in the first place to acquaint you that my lords have carefully considered the various statements made in the memorial, and that they are sensible of the value of the documents, &c., referred to as affording materials for the filling up the deficiencies of contemporary chronicles, and for tracing the growth of our national institutions But I am to request that you will inform the President and Council of the Society that, whatever decisions may be arrived at at a future date upon the question of editing such a collection of historical papers as that contemplated by the society, no vote for such a service can be included in the estimates of the coming financial year.—I am, sir, your obedient servant,

(Signed) "Robert Lingen."

"Society of Antiquaries of London,
December 17th, 1879."

"Sir,—I am directed by the President and Council of the Society of Antiquaries of London to acknowledge the receipt of your letter of the 13th inst., in which the Lords Commissioners of H.M. Treasury express their sense of the value of the national and other records referred to in the memorial which I had the honour of forwarding to you on behalf of the President and Council on the 28th inst., but add that no vote for such a service can be included in the estimates of the coming financial year. The President and Council instruct me to say that under these circumstances they, of course, forbear for the present to urge further their request, but they hope at some future and more convenient period they may again invite the attention of the Lords Commissioners to a matter which so nearly concerns not merely the historical student, but also the general interests of the public at large.—I am, sir, your obedient servant,

"C. Knight Watson."

This being an evening appointed for the ballot, no papers were read. The following were elected as ordinary Fellows:—Rev. J. A. Bennett, Rev. Canon Stubbs, Messrs. C. J. Ferguson, S Leighton, G Payne, jun., C. T. Gatty, J. Parker, jun., W. E. Howlett, S. R. Bird, and E. A. Bond; and as honorary Fellows, Mr F. A G. Campbell and Carlos Ribiero. Mr. Bond and Prof. Stubbs were proposed by the Council, *propter merita*.

Jan. 15th—E Freshfield, Esq., V.P., in the chair.—The Hon. C L. Wood was elected a Fellow. Mr. F. Ouvry exhibited a fragment of pottery of the thirteenth century dug out of the cliff at Lowestoft. Mr. W. de Gray Birch communicated notes on a charter of Eadgar, King of the Mercians, dated A D 958, belonging to the dean and chapter of Wells, by whose permission a photograph of the charter was also exhibited. This document was a grant by Eadgar to his faithful "minister"—the Latin equivalent for *thayne* or "thane"—Ealhstan, for forty *mancusa* of pure gold, of the land of six *manentes*, in a place called Stanton, in the territory of the Magesætæ, for ever, subject only to the "triple burden" of Saxon taxation of land, *i.e.*, the *trinoda necessitas*, or repairing of bridges, fortifications, and military service. This charter makes a slight contribution towards the solution of the vexed question as to the position of the "pagus Magesætna." It must evidently be in Herefordshire, and must be contiguous to a Stantun. Mr. Birch concluded his notes with an appeal to the society to take steps to organise some machinery for producing a proper Codex or Corpus of Saxon charters, with the text of every known charter collated, the dates worked out, the localities and personages as far as possible identified, the peculiarities of the language and of the terms pointed out and illustrated. A discussion followed, in which Messrs. H. C. Coote, H S Milman, T. Morgan, and the Chairman took part, and warm approval was expressed of Mr Birch's proposal to set about a new edition of Kemble's "Codex Diplomaticus The Rev. Baron communicated a paper on certain "Greek and other Early Features of Stockton Church, Wilts." The feature which had more especially impressed Dr. Baron with the notion of a reminiscence of Greek arrangement and ritual was the east wall of the nave, which had an opening in the centre, fitted with doors, and on each side one of those apertures variously called squints or hagioscopes. These seemed to him to recall the Iconostatis of a Greek church. In the discussion which followed, the Rev. B. Webb, Messrs W. White, H. T. Micklethwaite, E. R. Robson, and the Chairman confessed themselves unable to see any trace of Greek influence in the arrangements of Stockton Church. Dr. Baron's paper, however, contained a number of valuable incidental illustrations of early architecture and ritual.

Jan. 22nd.—E. Freshfield, Esq., V.P., in the chair. The following gentlemen were elected Fellows:—The Rev Canon Stubbs, Messrs. E. A. Bond, S. R. Bird, C. W. Dymond, G. Payne, jun., and the Rev. T F. Falkener. The council proposed for election, *honoris causâ*, Mr. E. M Thompson Mr. J. T. Micklethwaite exhibited four specimens of early glazed tiles from St. Alban's Abbey; Mr. C. H Fowler a silver-gilt ring, which had been found, as he believed, in the grave of Lawrence Booth, Archbishop of York (*ob.* 1480), in Southwell Minster; and Mr. J. Brent two matrices of brasses, of unknown origin, which he had purchased at Canterbury The Lords Commissioners of the Admiralty communicated a report which had been addressed to them by Capt. Sullivan, on the alleged discovery at San Domingo of the remains of the great navigator Christopher Columbus. Mr H. S. Milman called the attention of the meeting to a report which had been issued by the Royal Academy of Madrid on the subject of this alleged discovery in 1877, and stated that the conclusions at which the commission had arrived, after careful sifting of evidence, were unfavourable to the authenticity of the remains in question. Mr E. A. Bond said that the characters in which the inscriptions on the lid of the coffin were written, and of which a facsimile had been sent by the Lords of the Admiralty, were not such as to lend any support to the theory that these were the genuine remains of Columbus; neither did the language in which they were couched agree with the assigned date. Mr. Milman referred to an article which had been published on this subject by Sir Travers Twiss in the *Nautical Magazine*. The chairman observed that whatever might be the rights of the case, he was sure the society would feel how great were the obligations they owed to the Lords of the Admiralty and to Capt. Sullivan He hoped that many more communications might be received from the same quarter, as officers of the Royal Navy must have frequent opportunities of observing archæological remains. Mr. W. M. Wylie communicated an account of some interesting Pfahlban discoveries in the lakes of Bienne and Neufchatel, sketches of which he had received from Dr. F. Keller. One of the objects found was a huge implement of copper, in the shape of a *bipennis* or double axe, over 16 inches in length, and about 6lb. 9oz in weight. Mr. Wylie believed that this object was in an unfinished condition. He quoted various allusions in classical authors to the existence of a *bipennis* as a weapon of war. Mr. E. Peacock laid before the society some remarks on the use and history of the word "Osmund" as the designation (it would seem from the authorities quoted) of a kind of iron ore. Mr. Peacock was anxious to find some clue to the origin of the word Dictionaries seemed only to copy each other, and to throw no new light. Mr. J. E. Lee communicated an account of some remarkable cave explorations, which had been conducted with singular zeal and energy by the manual labour of one man, Mr. J. L. Widger, at Tarboyan, Devon These caves are five in number, of which probably one or two may be regular caves; one may be called a rock shelter, the others are little more than fissures They had yielded a large collection of flint implements, teeth of bear and rhinoceros, bones of the reindeer, horse, and wolf, or dog. To have achieved such results single-handed redounded highly, in the opinion of Mr. J. E. Lee—than whom no one could be a more competent judge—to the credit of Mr. Widger, whose perseverance and determination were beyond all praise.

JAN 29TH.—E. Freshfield, Esq., V.P., in the chair. The following gentlemen were appointed auditors for the past year. E. Freshfield, Dr. Ogle, H. C. Coote, and H. S. Milman. The following were appointed local secretaries:—Rev. J. Beck (Suffolk) Rev. T. Armfield (Essex), Mr. T. F. Kirby (Hampshire), and Mr. E. Purser (Asia Minor). Lord Dillon exhibited a gold bracelet, composed of hollow gold cylinders strung together, found at Pompeii, and given by Ferdinand I., King of the Two Sicilies, to Mr. W. R. Hamilton, formerly Fellow and Vice-president of the Society, who between 1822-1824 was ambassador at the Court of Naples, and who was connected by marriage with the Dillon family. Mr. R. W Binns exhibited an achievement of arms of the time of Elizabeth, comprising the arms of all the peers of the realm at that time for the year to which it belonged, painted on a square panel, which was the property of a so-called Hadley Club, near Worcester, which had existed for upwards of a century. On this object Mr A. W Franks made some remarks in identification of certain coats of arms which were rather obscure Mr J H. Middleton communicated an account of two marble pillars in the Ashmolean Museum at Oxford, which had belonged—as was shown from Sandford's engraving, and from undoubted marks of Torrigiano's handiwork—to the high altar of Henry VII 's Chapel at Westminster Abbey The secretary stated he had received a communication from Mr. W Burges, pointing out that he had already incidentally indicated the *provenance* of these pillars in a report he had made (1871) on the altar screen at King's College, Cambridge. The Rev W. D. Macray communicated an account of a curious volume, a small quarto of fifty-three pages, which seems to have entirely escaped the notice of those who have studied and written the history of Henry VIII. It was published, *circa* 1541, under the title "L'Oraison et Remonstrance de haulte et puissante Dame Madame Marie de Cleves, Sœur de treshault et puissant Seigneur le Duc de Juilliers, de Cleves, et de Gueldres: Faicte au Roy d'Angleterre et à ceulx de son Conseil. Joannes a Luxemburgo III. faciebat" It was printed, as the colophon states, at "La Riuou par Maistre Nicole Paris, Maistre ès Arts, treshumble Serviteur et Imprimeur de hault et puissant Seigneur Messire Jean de Luxembourg' By "Riuou" is meant L'Arrivour (Lat. Ripatorium), a Cistercian monastery in the diocese of Troyes (founded A D. 1140), where John of Luxembourg (third son of Charles of Luxembourg, Count of Brienne), Abbot of Ivry and Arrivour, third Bishop of Pamiers, had set up a printing press, under the direction of Nicole Paris, a printer whom he had brought from Troyes. (See the "Dictionnaire de Géographie à l'Usage du Libraire,' par un Bibliophile, s v. "Ripatorium.") Mr. Macray believed that the chief reason why this book had thus escaped the notice of historians was the blunder in the title, by which Anne is made to bear the name of her mother, Mary of Cleves. The book appears to have been written at the moment when the separation of Anne from Henry VIII. was under discussion, and is under the form of an appeal from Anne herself to the king and amid the flattery with which it abounds are some sharp insinuations and reproaches, which must have irritated the monarch not a little. The covert object of the book—which the French king promised the English ambassador Paget should be suppressed (see State Papers, Hen VIII, part v p 660)—was no doubt to damage Henry VIII in the eyes of Europe. A second edition, however, followed the first, in spite of the promise of Francis I., and from France the book passed into Italy, where a translation appeared at Bologna in 1558; but, strange to say, no mention has ever been made by any English writer of this attempt to enlist sympathy abroad in favour of Anne of Cleves.

ROYAL SOCIETY OF LITERATURE.

JAN. 28TH.—J. Haynes, Esq., in the chair. Dr. Ingleby read a paper "On the English Spelling Reform Deadlock" in which he stated that he had joined the English Spelling Reform Association, because in the interest of education it appeared to him to be expedient to amend the existing spelling of English, the time having now arrived, he thought, when combined action should be adopted with the view of thoroughly improving the present system. He agreed that a normal orthography should be accepted for the spelling of our language; but he was not prepared to accept a purely phonetic plan, the basis of which ignores our usual pronunciation. Dr. Ingleby added a careful notice of the schemes proposed by Dr. M. Bell and Mr. A. J. Ellis.

ENTOMOLOGICAL SOCIETY.

JAN 21ST—Anniversary Meeting.—Mr. J. W Dunning, V P., in the chair. The following gentlemen were elected as officers and council for the ensuing year:—President, Sir J Lubbock, Bart.; treasurer, E. Saunders, librarian, F. Grut; secretaries, R. Meldola and W. L. Distant; other members of council, H. W Bates, W. Cole, J. W. Dunning, F. du Cane Godman, O. Salvin, H. T. Stainton, S. Stevens, and J. J. Weir. In the absence of the president, an address was read by Mr. J. W. Dunning.

BRITISH ARCHÆOLOGICAL ASSOCIATION.

JAN 7TH—Mr. T. Morgan in the chair.—Mr T. Watling reported the discovery of some elaborately ornamented bronze vases of Roman date at Ixworth. A large collection of antiquities from various places was exhibited by many members, among which was a portion of an iron shot, 4 in. in diameter, found at Allington Castle, a relic of the siege of that building. Mr. Compton produced a deed of admittance to the Manor of Woking, granted to John Macknell, 1654, which was found in Ewhurst Church, Sussex, during repairs. Mr Loftus Brock described the works, now far advanced, at the Tower of London, which have so far resulted in the clearing of the space between the inner and the outer walls. The towers and walls now thrown open to view present an aspect of great strength, and are well worthy of inspection. A portion of the original Norman work of the White Tower is also visible through the removal of the Armoury. Mr. R. Allen read a paper descriptive of a remarkable prehistoric cist at Kilmartin Church, Argyleshire. It was found about ten years ago during some trenching works for plantation. It is 6 ft. 10 in long by about 3 ft. broad Its construction of rough stone resembles many others, but in this instance it is remarkable for having two of the end stones sculptured with singular devices. On one there are seven axeheads, and on the other a singular comb-like grouping, which Mr. de Gray Birch considered to resemble a true Ogam. Mr Allen pointed that these carvings are unique in Great Britain, although a few of somewhat similar form have been met with in Brittany, rubbings of which were shown. The second paper was by Mr. S. H Jeayes, "On Ancient English Guilds,' with reference to some unpublished documents which were exhibited or described. One of these was a form of admission to the Guild at Boston, a printed sheet by Pynson, with the names left blank for filling up. These documents mostly related to the days or periods from which the members were to be absolved from the pains of purgatory, and were in other respects very curious.

JAN. 21ST.—Mr. S. Cuming in the chair. Mr. R. Blair exhibited the impression of an engraved carnelian found at South Shields, where so many similar objects have been found. It represents a winged equestrian figure, engraved—as Mr. King, of Cambridge, supposed—to record some particular cavalry charge. During the recent works at Bangor Cathedral an engraved sepulchral slab of much beauty was found A photograph of this object was exhibited by Mr. Irvine. It represents a lady clad in the costume of the middle of the fourteenth century, with the peculiar head-dress of the period, and a curious side purse hanging from the waist. The Rev. S. M. Mayhew again contributed a series of remarkable objects. Some Rhodian glass attracted much attention, but the principal interest centred in a singular branched candlestick of metal, having five lights arranged like the seven-branched candlestick of the Temple of Jerusalem. It was of Indian workmanship of ancient date, and it caused an animated discussion upon the existence of Jewish elements in Hindustan. Mr. W. Smith produced several prehistoric flint implements picked up by him from the metal ling recently laid on the roads in the north of London. The gravel thus used had been obtained from pits in the same locality. Mr. L Brock, in calling attention to the differences between the Gris de Flandre ware of the Low Countries and that made at Fulham at the end of the seventeenth century, exhibited a curious jug of undoubted foreign manufacture. Miss Halliwell-Phillipps forwarded a drawing of an early doorway at Patcham Church, near Brighton. The first paper was by Mr. H. W. Cope, and was descriptive of ancient jade implements. After referring to the recent discovery in the Rhone, he spoke of this material being known in the oldest city of Ilium, and traced its use to modern times, illustrating his remarks by the exhibition of objects of great value and beauty The second paper was by Mr. W. de Gray Birch, "On Inedited Documents." These were from Norwich, Ely, Wells, &c. One of the last referred to a fair formerly held in the nave of the cathedral.

MATHEMATICAL SOCIETY.

JAN. 8TH.—C. W. Merrifield, Esq., President, in the chair.—Prof. W. S Burnside was elected a member.—Prof. Cayley communicated a theorem in spherical trigonometry and a note upon a posthumous paper of Prof. Clifford's, "On the Theory of Distances." The Chairman supplemented his paper read at the December meeting with a few further remarks. Mr. Hammond gave an expression for the complementary function in fractional differentiation. A discussion arose upon the subject, in which Prof Cayley, the Chairman, Messrs. Roberts, Glaisher, and Freeman took part.

INSTITUTION OF CIVIL ENGINEERS.

JAN 13TH —The new President, Mr. W H. Barlow, delivered an address. Twenty-three candidates were elected, viz., Messrs. H. R. P. Carter, T C. Fidler, C. O'Neill, T Seyrig, H Wallis, and T. P. Watson as members; Messrs W. Crickmay, G Darbishire, A. Downie, J. Francis, L. P. P. Galwey, G. A. Goodwin, J. Horan, H. G. McKinney, A. Primrose, H de Q. Sewell, J. Standfield, R. F. Ward, H. Woodcock, and W. B. Worthington as associate members; and Messrs. W. M Cunningham, J. M. Lives, and W. H. Topham as associates

JAN. 20TH.—Mr. W H. Barlow, President, in the chair.—The following papers were read: "On Fixed and Movable Weirs," by Mr. L. F. Vernon-Harcourt; and "On Movable Dams in Indian Weirs," by Mr. R. B. Buckley.

FEB. 3RD.—Mr. W. H. Barlow, president, in the chair. It was announced that the council had recently transferred Mr John Penn to the class of members. The monthly ballot resulted in the election of Mr. J. Tyndall as an honorary member; of Messrs. G. Anderson, J. C. Bothams, C. A Brereton, T. W. Miles, and S. A. Stewart as members; of Messrs. A. W. H. Bellingham, R. C. Brebner, J. G. Chandler, C. W. F. Farewell, J. R. George, C. H. Holme, H. B. Hutchings, G. Jameson, R. H. Julian, J. W. Logan, E. R. Morris, W. W. Shanks, C. L. Sim, G. H. Sykes, J. C. Vandrey, and F. Walsh as associate members; and of Capt. S. Buckle, Messrs. R. Capper, C. Higgins, and J. O. Phillips as associates.

ASIATIC SOCIETY.

JAN. 19TH.—Sir H. C. Rawlinson, President, in the chair.—Prof. Dowson read a paper "On a Curious Litigation between the Smartava Brahmans and the Lingayats when two Copper Plates were produced," in which he stated that the Smartava Brahmans, in the south of India, have twelve Maths, or monastic establishments of high antiquity. The chiefs of those Maths are held in great honour, and among the marks of their dignity is the privilege of being carried in a *palki* crosswise, so as to sweep the road. These Brahmans are much troubled by the Lingayats, a dissentient sect some six or seven centuries old, who are very numerous in their neighbourhood. The chief of these Lingayats, to assert his own dignity, caused his *palki* to be thus carried, the result being riots and disturbances. At length the head of a Brahman Math brought an action against the Lingayat for damages in compensation for the loss of the honour he deemed due to him, at the same time producing two copper plates, dated in the twelfth century, A D., and purporting to be grants of this privilege from a monarch of the time. The Brahman, having lost his suit, appealed to her Majesty in Council, translations of the two copper plates being sent home with the appeal. As these, however, were unintelligible, the case was referred back to India, but though many years have passed, no more has been heard of it. The impressions of the copper plates then sent having been very indistinct, Prof Dawson suggested that endeavours should be made to obtain more accurate copies, as the originals are certainly of some antiquity, and contain many curious references. He added that there was reason for suspecting them to be forgeries, as there occurs on them the name of Madhava, a teacher who lived two centuries later than the date ascribed to them. Moreover, the words rendered *cross-palki* do not bear this meaning.

NUMISMATIC SOCIETY.

JAN. 15TH.—J. Evans Esq., President, in the chair.—Mr. Stephen was elected a member. Mr Hoblyn exhibited a shilling of Charles II., 1663, with the arms on the reverse blundered: a crown of William III., 1696, reading GEI GRATIA (*sic*); a shilling of the same year, with a capital Y (for York); a shilling of Anne, 1711, with the younger bust, although the old or fourth bust had appeared on a shilling of the previous year. Mr Henfrey exhibited an unpublished annulet groat of Henry V or VI., struck at London, but having the annulets on either side of the king's bust instead of, as is usual with the London groats, on the reverse. Mr. Evans exhibited a sovereign of Henry VII.'s first coinage, much bolder in style than those of the later issues and of extreme rarity. Major A B. Creeke communicated a paper on silver coins of Eanred and Ethelred II of Northumbria, similar in all respects to the copper stycas. Mr. P. Gardner read a paper on the indications afforded by the coinage of Macedonia and Thrace of the worship of the sun in those districts, in which he drew attention to the various solar symbols occurring on the coins of the towns of Uranopolis, Mesembria, &c.; on those of the kings Antigonus Gonatas, Philip V., and Perseus; and on the money of Macedonia under Roman dominion. He identified the Thracian Ares as a solar divinity, and expressed it as his opinion that the laureate head on the gold money of Philip II. of Macedon, usually called Apollo or Heracles, was in reality intended to represent Ares. The aspect of this head bore, Mr. Gardner said, a striking resemblance, which could hardly be fortuitous, to that of the head on the bronze coinage of the Mamertini in Sicily, which is expressly designated on the coins themselves as that of Ares. A discussion followed, in which the President concurred with Mr. Gardner, while Mr. B. V. Head was inclined to doubt whether Philip, who prided himself especially on being a Hellene and the bulwark of Hellas against the barbarians, would have chosen the god of the barbarous Thracian tribes whom he had just subdued as the principal device of his new gold coinage, in preference to the Hellenic Apollo or Heracles

STATISTICAL SOCIETY.

JAN. 20TH.—Sir R. W. Rawson in the chair. —Mr G. P Bevan read a paper "On the Strikes of the Past Ten Years."

CHEMICAL SOCIETY.

JAN. 15TH.—Mr. Warren De la Rue, President, in the chair.—The following papers were read: "On the Effects of the Growth of Plants on the Amount of Matter Removed from Soil by Rain," by Dr. J. H. Prevost Soil three inches deep was placed in two glazed earthenware pans, seventeen inches in diameter; on July 21st four grm. of white clover seed were sown in one, the other being blank. The pans were exposed till October 4th; the drainage water was collected and analysed; that from the clover soil contained 48·1 grains of solid matter per gallon, the other 220. The author concludes that rain removes much more matter from an uncropped than from a cropped soil. Mr. W. Blyth described a simple apparatus for the treatment of substances in open dishes by volatile solvents. "On Dibromanthraquinones," by Mr. W. H. Perkin.

ANTHROPOLOGICAL INSTITUTE.

JAN. 13TH.—J. Evans, Esq., V.P., in the chair.—Dr. H. Tuke read a paper "On the Cagots." The author, rejecting the popular derivation of the word from "Canis Gothi," accepted the suggestion of M. de Rochas that Cagot is derived from the Celto-Breton word *Cacod* (Leprous) It is easy to see how readily this would assume the form of Cacou (as it is in Brittany actually applied to these people), and so the French Cagou or Cagot. The conclusions at which the author arrived as to the origin of the Cagots were as follows:—1. The Cagots are not the descendants of the Goths, they are not a distinct race, but a despised class among the people of the country in which they live. 2. They are not more subject to goître or to cretinism than the inhabitants of the adjacent district—in short, Cagotism and cretinism are in no way allied. 3. The present representatives of the Cagots are now recognised by tradition, and not by their features, and are not distinguished by any peculiar mental or physical disorder. 4. Although nothing like leprosy or leucoderma has for a long time affected the Cagots, and no one on the spot regards them in this light, there is evidence to show that they were originally either lepers labouring under a particular variety of leprosy, or were affected with leucoderma—the form of the affection accounting for their being regarded as in some respects different from ordinary lepers, though shunned in the same way. 5 Many were no doubt falsely suspected of leprosy in consequence of some slight skin affection; others again, in later centuries, were members of families in which the disease had died out. The Director read two papers by Mr. A. Simson, "On the Jivaros" and "The Canelos Indians." The tribe of the Jivaros is a large one, and one of the most distinguished, independent, and warlike in South America. They speak a language of their own, Jivaro, and occupy the country generally from the Upper Pastassa to the Santiago, both rivers included, down to the Pongode Manseriche, on the Maranon They are hospitable, and their houses are large and built of palms. They have a most perfect method of scalping, by which the victim's head is reduced to the size of a moderately large orange, maintaining tolerably well all the features. The skin is cut round the base of the neck, and the entire covering of the skull removed in one piece. This is then dried gradually by means of hot stones put inside it, until the boneless head shrinks to the required size. They also wear their slain enemies's hair in long plaits round the waist. Great festivities take place when a child, at three or four years years of age, is initiated into the art and mysteries of smoking. The Jivaros of the Pintue have the habit of vomiting nearly every morning by the aid of a feather, arguing that all food remaining in the stomach overnight is unwholesome and undigested, and should therefore be ejected. Canelos, the once attractive Spanish settlement, but now forlorn Indian village, is situated on the left bank of the Bobouaza, one of the most important, if not the largest, of the tributaries of the Upper Pastassa, and is inhabited by a mixed tribe of Indians, in whom the chief element is Jivaro, though some of the better traits of these seem to be wanting in them. Their languages is Quichua. Their fighting is done entirely by the lance, which is their inseparable companion, and all the author's attempts to induce any of them to part with his weapon were fruitless.

LINNEAN SOCIETY.

JAN. 15TH.—Prof. Allman in the chair Messrs. J. Poland, J D. Stephens, and Prof. A Thomson were elected Fellows, and T. J. Parker an associate. Mr. A. J. Hewett exhibited and made remarks on a common web or community of cocoons and the moths (genus Anaphe?) escaped therefrom, said to have been got at Old Calabar. Mr. Baker brought under notice a monstrous form of thistle (*Carduus crispus*), obtained by the Rev. J. A. Preston in Wiltshire. In this specimen the capitula were abnormally numerous, and aggregated in secondary heads, as in Echinops. A Moa's tibia and tarsus (*Dinornis maximus*), dug up four feet from the surface at Omane, New Zealand, were shown on behalf of Mr. J. Forsyth A paper was read "On the Birds and Mammals introduced into New Zealand," by Mr. H. M. Brewer. The author refers to Dr. Buller's "Avifauna" of New Zealand as not written too soon, for the rapid disappearance of many highly interesting forms is to be deplored. Finches and other small birds introduced are preyed on by the New Zealand owl: but nevertheless quite a long list of British songsters, game birds, and others has been established. In some districts pheasants abound; and it is noteworthy that when the tremor of an earthquake occurs the cock pheasants set up a continuous crow, either of fear or defiance. Partridges thrive best on the south island. Red deer are seen in herds on the hills near Nelson. Hares have increased too rapidly, and the female in New Zealand has become more prolific, giving birth to six or seven at once. Kangaroos and various mammals have likewise been imported; but unfortunately facts mentioned point out that the acclimatisation of some of them is not altogether an unmitigated blessing to the farmer colonist. There followed a memoir by Mr. J. G. Baker, "Synopsis of the Aloineæ and Yuccoideæ." To these two tribes belong all the shrubby arborescent tribes of the capsular Liliaceæ. Aloes being entirely to the Old World, out of a total of 200 species, 170 are concentrated at the Cape of Good Hope, the remainder in the highlands of tropical Africa. Of the Yuccoideæ there are about fifty species altogether, and nearly all are natives of Mexico and the southern United States. The Yuccas fruit rarely under cultivation, the large white pendulous flowers being in the wild plant fertilised by a moth of the genus Pronuba. Herreria, belonging to temperate South America, is a shrubby climber.

ZOOLOGICAL SOCIETY.

JAN. 20TH.—Prof. Flower, president, in the chair The secretary read a report on the additions made to the menagerie during December Mr. H. N. Mosely exhibited and made remarks on some microscopic preparations of corals, made by a new method invented by Dr G V Koch. Prof Flower read a letter addressed to him by Colonel Heysham, of the Madras Commissariat Staff, on two cases of female elephants, in India, having produced young in captivity. Dr. A Gunther exhibited and made remarks on a drawing of a West Indian fish (*Holacanthus tricolor*), obtained on the coast of the Island of Lewis, and believed to have been found for the first time in the British seas Mr. P. L. Sclater read some remarks on the species of the genus Tyrannus, in relation to a paper on this subject recently published by Mr. Ridgway in America. Papers and communications were read from Mr R. Trimen on a new species of Roller (Coracias) from the Zambesi, which he proposed to name *C. spatulata*, from its long spatulated tail; from Mr. A. Agassiz, of Cambridge, Mass., on some points in the history of the synonymy of Echini, in reference to some papers recently published by Mr Bell in the Society's *Proceedings*, and by Mr F Moore on the genera and species of the Lepidopterous sub-family Ophiderinæ inhabiting the Indian region.

METEOROLOGICAL SOCIETY.

JAN 21ST.—Annual General Meeting.—Mr. C. Greaves, president, in the chair. Dr. Tripe read the Report of the Council for the year 1879, which showed that the society was in a satisfactory condition; eighty-four new Fellows have been elected, and the total number at the end of the year was 473 The great local differences in temperature and humidity require to be more accurately ascertained than they are at present, and this remark applies not only to sea-side places, but also to inland districts in their relation to hills and valleys. It is with a view of obtaining better knowledge on this subject that the council have instituted a new class of stations of a third order, to be termed "Climatological," at which observations of temperature, humidity, cloud, and rainfall are taken daily at 9 a.m. only, with certified instruments, the thermometers being in Stevenson's screens, so that the observations of temperature at the different stations may be strictly comparable. The total receipts for the year were £799 6s 9d., and the expenditure £621 19s. 5d., leaving a balance in favour of the society of £177 7s. 4d. The president delivered his address, in which he advocated a more attentive inquiry by the students of meteorology into the subject of hygrometry. The following gentlemen were elected the officers and council for the ensuing year:—President, G J. Symons; vice-presidents, E. E. Dymond, C. Greaves, Rev. W C. Ley, and Captain H. Toynbee; treasurer, H. Perigal; trustees, Sir A. Brady and S. W. Silver; secretaries, R. H. Scott and Dr J. W. Tripe; foreign secretary, J. K Laughton; council, A. Brewin, W. Ellis, R. Field, F. Gaster, Dr. J. H. Gilbert, W. J. Harris, B. Latham, R. J. Lecky, Hon. F. A. R. Russell, R. Strachan, H. S. Tabor, and G. M. Whipple.

GEOGRAPHICAL SOCIETY.

JAN. 26TH.—Lord Houghton in the chair. The following gentlemen were elected fellows:—Major S. T. Bridgford, Lieut. L. A. Wainwright, Messrs. S. N. Braithwaite, T. Christy, H. H. Crewe, J. Dixon, J. M. Head, W. L. Hunter, S. Lowe, C. J. Palmer, M. Stratford, E. Stock, S. Stubbs, and W. Watson. The paper read was a "Journey through South Central Africa, from the Diamond Fields to the Upper Zambesi," by Dr. Emil Holub.

QUEKETT MICROSCOPICAL.

JAN. 23RD.—Dr. T. S. Cobbold, president, in the chair. Eleven new members were elected. Portions of Ostend rabbit containing large quantities of Cysticercus were placed upon the table for distribution, and the nature of this Entozoon was briefly described by the president. The president also exhibited a large section of bone newly formed round the shaft of a human femur destroyed by necrosis. Mr. Ingpen exhibited and described Mr. Wenham's new immersion illuminator, the merits of which were afterwards discussed. Dr. H. Whittel read a paper "On the Association of Bodies resembling Hydrosperma with the Degeneration of Hydatid Cysts," in the course of which he detailed a number of facts tending to show that the existence of these bodies in the fluid drawn from hydatid cysts indicated the death of the Echinococci and the degeneration of the cyst, of which changes he regarded them rather as a result than a cause. Some observations on the same subject were made by the president Mr. A. D. Michael exhibited and described some specimens of *Ornithobia aviculata* and other insects found parasitic upon a jay.

PHOTOGRAPHIC SOCIETY.

JAN. 13TH.—J. Glaisher, Esq., president, in the chair Mr. L Warnerke, who at the previous meeting had described all existing actinometers, on this occasion read a paper "On a New Actinometer" of his own invention, based upon the use of phosphorescence as a retainer of light. He has devised an ingenious apparatus, which permits the sensitive substance to be seen under gradually darkening figures. The number last seen before the light becomes invisible determines the value of the actinic power at the moment.

PHYSICAL SOCIETY.

JAN. 24TH.—Prof. W. G. Adams in the chair. Mr. W. Ellis was elected a member. Mr. Grant read a paper "On Induction in Telephone Circuits," and Dr. O. J. Lodge detailed the mathematical theory of the action of Prof. Hughes's induction balance. Afterwards Herr Faber exhibited his new speaking machine to the audience. This consists in a mechanical imitation of the human organs of articulation, including a bellows for the lungs, a windmill for trilling sounds, a larynx, lips, tongue, and nose. By means of certain levers to work these organs fourteen distinct oral sounds can be produced, and by combining these again any word of any language can be uttered by the machine.

ROYAL INSTITUTION.

FEB. 2ND.—Duke of Northumberland, president, in the chair. His Royal Highness Prince Leopold, K.G. was elected an honorary member. Messrs. J. Carteighe and F. C. Mathieson were elected members.

SOCIETY OF BIBLICAL ARCHÆOLOGY.

FEB 3RD.—Dr. S. Birch, president, in the chair. Six new members were elected. The following paper was read:—"Some Remarks on Excavations made in Tel-el-Yahoudee (the Mound of the Jew), near Cairo, and on some antiquities brought therefrom and now in the British Museum," by Prof. T. H. Lewis. Mr. Pinches announced that he hoped to be able to lay before the next meeting of the society some account of a table of peculiar interest. So far as he had been able to examine it, it appeared to contain the annals of the sixth, seventh, eighth, ninth, tenth, and eleventh years of the reign of Nabonidus (about B.C. 550-539), giving some new information. The reverse of the tablet contained facts of great historical importance—evidently the history of the last year of the reign of Nabonidus (B.C 538), giving an account of the overthrow of this king and capture of his city of Babylon, on the 16th of the month Tammuz, by the celebrated general Gobryas, under Cyrus the Great, King of Persia.

SOCIETY OF ARTS.

JAN. 30TH—Admiral Selwyn in the chair. A paper "On Herat" was read before the Indian Section of the Society by Colonel G. B. Malleson.

FEB. 2ND.—The opening lecture of the second course of Cantor Lectures, "On the Manufacture of India-Rubber and Gutta-Percha," was delivered by Mr. T. Bolas.

FEB. 3RD.—W. C. Sargeant, Esq., in the chair. A paper "On Social and Commercial Prospects in the Transvaal' was read before the Foreign and Colonial Section of the Society by the Rev. G. Blencowe.

FEB 4TH.—C. R. Markham, Esq., in the chair. The paper read was "On Trade and Commerce with Siberia *via* the Kara Sea,' by Mr. H Seebohm.

SOCIETY OF ENGINEERS.

JAN. 28TH—Mr R. Paulson Spice, the past president, presented the premiums of books which had been awarded to the following gentlemen for papers read during the past year, viz :—To Mr. C. J. Alford, for his paper "On the Mineralogy of Sardinia,' and to Mr. T. Andrews for his paper "On Wrought Iron Axles" Mr. J. Bernays, who had been elected president for 1880, delivered his inaugural address. Mr Bernays regretted the loss of the valuable services of Mr. P. F. Nursey, their late secretary, who was now, however, still useful to the society as a member of council

ON LIGHTING MINES.

BY MR. PURDY.

AFTER some eloquent statements as to the fearful character of mine explosions and scientific explanations in regard to them, Mr Purdy, in his paper which was read by Mr T. Morgan before the Inventors' Institute last month, proceeded as follows :—

The question of lighting our mines has been for many years one of great interest, and since men have to leave the light of the sun to delve in the earth, some artificial light has to be provided. Perhaps one more suitable for the miner to carry out his work has not been introduced than the old primitive candle and a lump of clay, as he can move it anywhere at his will, and so place it to throw its light on the spot where he requires it. But since naked lights are not safe other means have had to be provided. It is an old saying that necessity is the mother of invention Perhaps no question has, or ought to have, aroused the inventive powers of engineers and mechanics than a safety lamp for the miner. It is said, since the year 1710, when explosions first appeared in Belgium resulting from working coal seams, that not less than 400 patents and improvements in safety lamps and locks for the same have been entered, and perhaps one that will meet every requirement of the miners has not yet appeared. At the same time I fully believe that had the men who have distinguished themselves in this cause been more practical, a thorough safety-lamp would have been arrived at many years ago. History holds out some facts that safety lamps were tried for by various persons many years previous to the gauze lamps. Dr. Clanny in 1814 was moved to do something in the protection of the flame from fire-damp when he proved to the Royal Committee that more than 200 men's lives had been sacrificed in that year by explosion of fire-damp, leaving over 300 women and children unprovided for. The fact was generally known throughout our own and other countries that some protection was needful, and as explosions increased rapidly, resulting in loss of life and property, Dr. Clanny at this time invented a lamp, and thought he had overcome this great evil in mining. But his lamp was cumbersome, as he forced air in through a thin layer of water by means of a bellows. In 1815, Sir Humphry Davy made the wonderful discovery of the gauze as a protector of the flame from fire-damp, and found by his experiments that flame would not pass through a fine gauze mash, having 784 apertures to the square inch, without being drawn or propelled. George Stephenson, in this same year, had arrived at his third safety lamp. Previous to the year 1814 many inventions had been tried, for explosions rapidly increased. It is the opinion of some that had Stephenson's third lamp been introduced to Government he would have been honoured. But Davy being a more learned man introduced his lamp to Government, and not only got honoured, but his lamp was extensively used for a long time. The Stephenson lamp was to some extent lying dormant. The Royal Committee of 1835, after collecting a large amount of evidence, proved that more persons had lost their lives from colliery explosions for the eighteen years succeeding the introduction of the Davy safety lamp in 1816 than the eighteen years preceding the invention. When the lamp was experimented on in the presence of Sir Humphrey, and the gas exploded outside, then Sir Humphry, addressing Lord Durham and many other gentlemen present, said, "Now, gentlemen, you see the nature of the danger which you are exposed to in using the lamp, and I caution and warn you not to use it in any such places if it can be avoided without the shield." Unfortunately these explosions did not cease then, but have been rapidly increasing since 1710. Notwithstanding the inventions and improvements of safety lamps, and the scientific achievements that have been made in ventilation of our mines, loss of life from this cause has increased year by year During a period of the last 23 years from 1856 to 1878 inclusive, not less than 5,556 lives of our honest-hearted British workmen have been sacrificed through colliery explosions, and in this period of time 2,401,917,538 tons of coal have been raised in Great Britain and Ireland; and in the present year a fearful number is already scored on, notwithstanding the use of safety lamps and powerful apparatus for ventilation. It is supposed that three-fourths of these explosions have occurred under atmospheric changes. It will be clear to all practical men from experiments made of late, and explosions on the very surface of safety lamps, which have distressed our country that they cannot be trusted in the hands of inexperienced men, and this is sufficient argument to prove the gauze lamps to be nothing more than pictures of safety and not realities. For the very lamps that have been depended on for safety have proved a deadly weapon cherished in the bearer's hands. It is to be feared that colliery managers have, to a great extent, thought, because they had put lamps in the hands of workmen they were safe to work anywhere so long as their lamps would burn The gauze lamps have been relied on until they have become nothing more than darkness in light. Recent experiments have proved that certain velocities will pass the flame through the gauze lamp, notwithstanding all the careful experiments that have been made with various lamps. It is really difficult to say of explosions how they occur, and by what means even if defective lamps be not found. Now, it is well known to practical men that breaks in the roof, floor, and sides are everything but in an upright or downright position, and more or less slant. When blowers make their way out of the floor, the breaks and upheavings which serve as channels or pipes to liberate the contents of fire-damp into the gate roads and working face, and pouring forth its discharge from many of these slant breaks at once. Then as a lamp is hanging, or carried across these slant feeders in an upright position, and in contact with these jets of gas which are pouring out at a furious rate, same propel the flame through these gauze lamps, and ignites the mixture outside, and no one can limit its destruction Again, these lamps hanging up an accumulation of gas, same explodes inside the gauze lamps, and burns whilst there is oxygen to feed it. The gauze being of tender nature is speedily red hot, and thus ignites the gas outside. This evil may occur when a man or boy is carrying his lamp in his hand, as this may become red hot without being noticed till it is too late. Again, a workman or unskilled overman may be trying working places, cavities, or high breaks, the mixture may be at a violent point ; he may slip or fall, or if it be a rare occurrence to see gas, may be frightened, bring down his lamp suddenly, and thus propel the flame through the gauze Again, a blown-out shot, a door being left open, may cause a rapidity in the current, or stagnation in the current be caused by any derangement in the ventilation, which is followed by a mighty rush, blowing up the dust through the gauze, and igniting the mixture of gas and hot dust. Again, the gauze top may be covered with dust, and the lamp becoming shaken cause a stream of flame from the wick to the top of the gauze. Again, the lamp may be carried with or against the current across these jets of gas oozing from the floor or other breaks, and quickly become red hot. Practical men in fiery mines will have experienced the gas exploding in the gauze, and re-lighting the wick several times over. The Stephenson's lamp is the safest I am practically acquainted with, but in this the gauze is a source of weakness and danger. It will be clear to all when gas explodes it also expands with great rapidity and force, and the lamp being put into fire-damp the gas fills in through the gauze round the glass cylinder. It depends on the mixture and the conditions of the lamp whether the gas is exploded outside the gauze by the rapid expansion of the explosion inside, for flame can be forced through several thicknesses of gauze if the power be sufficient to do it Another danger in the Stephenson lamp is the gauze being too short and not covering over the air holes, or being split at the bottom by forcing up the brush to clean them, or being nipped too tight at the bottom and forcing them from the rim, as miners are always obliged to carry them through straight and confined places with their hand tightly round the bottom of the gauze, or the quick velocity of air would put them out, then wires becoming displaced or broken endanger the lamps. All these, simple as they are, make the lamps nothing more than naked lights. Two of these lamps that I experimented on exploded in my hands, and the others were split at the bottom. This led to a further examination on the others and I venture to say that out of every hundred of these lamps ten explodes if put under experiment, and one in ten thousand is sufficient to cause a fearful disaster. The evil of splitting the gauze exists in all lamps when they become old and tender. But it will be clear that a faulty lamp is not needed to cause an explosion. A few years ago a workman went to examine his working place previous to commencing work with a Stephenson's lamp when the gas exploded at the lamp ; when it was examined it showed that short guage existed. Still, further, a few facts will show how easily these lamps and the screw locks are tampered with. The first that ever I saw, a man got his lamp to his mouth and held the bolt with his teeth whilst he turned it round, took the top off, and lit his tobacco. Another threw up the glass cylinder of the Stephenson lamp and sucked the blaze through the gauze, and lit his pipe, and many times at the Clanny and Davy, as this could could be easily done by putting up the blaze and sucking it through the top or sides of the gauze. But there is no difficulty in unlocking these lamps, for anything will do. False keys, nails with a nick filed in to fit the square of the bolt; a bit of wire bent in the shape of tongues, and held together; small bits of wood lapped with wire; small nails, pick points, &c. All these I have witnessed in tampering with lamps. Few men are aware of the temptations there are for miners to unlock each other's lamps for the purpose of relighting them where naked lights are prohibited. When there are from eight to twelve men in a stall or working place, there are generally two spare lamps allowed for each place, but no one has any right to the use of these save the contractors. A man having his work by bargain, and getting his lamp out, has perhaps to go a mile or more to the bottom and send it up to be relighted; the lamp men will send it down when they think well. The engine-men are kind enough to run the cage in the bottom hard enough to put the lamps out for a few times, and when told of it make sport of same. I have known men to be away from their work for a hour and a half, and experienced it myself. For it was seldom that a lamp could be had to go with, and I was obliged to either go in the dark or wait till the ganger came in. This would throw men about one shilling and sixpence out of their wages. I have known this evil to exist to such an extent that it was a common practice to unlock and light each other's lamps, and men getting their lamps out would even put others out so that all might be concerned in the secret. The first time I worked with lamps, after six or eight months I found two wires broken in my gauze. I was pleased enough to instruct the lamp man of this danger, who said the gauze was wore quite thin. This resulted in a shilling fine out of my pay. Men have even worked with wires broken and displaced for a long time, as they knew well when they were found out a shilling fine would be the result, whatever might be the cause. I hope it will not be thought that these evils are a lot of concocted theories merely got up for this purpose, but they are facts that can be proved. And one false step in a thousand is sufficient to terminate in a dreadful dissaster. I do not wish it to be understood that I am trying to bring any contempt on the inventors and improvers of safety lamps, for I would rather bare my head and bow with reverence to a statue of these men than to the greatest warrior that lived.

Being practically acquainted with mining and the use of safety lamps, no one has seen the need of a better lamp and lock than myself, and my feelings were aroused on this subject of a better lamp after seeing the dreadful reports of explosions in the year 1878, and I have tried in every possible way to overcome every evil as far as my inventive powers will allow, so as to present to the mining world a thorough safety lamp, one that will meet every requirement of the miner and one that cannot be tampered with. Although it may seem very simple in its construction, merely substituting one thing for another, yet the simplest thing about it has cost me the most time and trouble. Nearly everything in the lamp I arrived at a month before my patent was entered. The locking of the lamp has to me been most difficult to arrive at.

The construction of my lamp is as follows: I secure a metallic dome, consisting of a cylinder or cylinders, shell, or shells, and as heretofore a gauze. In the dome is secured above the glass an iron, or other metallic tube having a copper perforated cap, over which is fitted a gauze cap, through which the heated air readily escapes, and passes out through the ventilating boxes at the top of the dome. The gallery beneath is secured to the dome by pillars, in which is fitted the glass, secured with a gauze drum or ferrol fitted to face the air-holes in the hollow rim in the gallery through which the air passes to feed the flame. The reservoir is screwed and fitted perfectly safe in the neck of the gallery. A small tube is inserted in the reservoir, through which moves the pricker for raising and lowering the wick in a flat or round tube. For the locking of the lamp I secure a cylinder inside the vessel, in which is fitted a piston having a rod or bolt passing through and projecting above the rim on side vessel, which is held up by a spring on the principle of a cornet valve. When the top is secured on, the bolt is held up by the spring into the recess in the neck of the gallery, which is prepared to receive it, and thus held perfectly safe. In the bottom of the cylinder is a hollow-threaded screw, studded on the inside, so that it cannot be taken out, and a button or stud on the outside, rivetted or brazed, with a hole bored into the screw, which being screwed up carries the air-hole to inside the lamp. For unlocking the lamp I secure a pump with two valves on the pneumatic principle, worked with a lever or otherwise. The hollow screw being released a little allows the air-hole to be accessible, same being tightly held into an elastic-faced cup connected to the pump, which exhausting the air from the cylinder allows the piston to bring down the bolt on the spring lower than the recess, allowing the lamp to be screwed off for cleaning, replenishing, &c.

The advantages I claim for the lamp are as follows:– It is a good light. The blaze cannot be drawn or propelled through the lamp. It cannot be exploded in any mixture or velocity. The flame never leaves the wick to pass into the dome. It is sensitive to gas. It extinguishes itself instantly when contacted with gas. It will stand a greater current of air. It cannot be tampered with nor unlocked without the apparatus. The lock is self-acting. The economy is a great consideration in cleaning and repairs. The shield I have prepared gives a great advantage to miners' eyesight. It will perhaps not be out of place to say my first experiments on this invention was to ventilate the lamps with small tubes, and to runaway from the principle of the gauze altogether, seeing that all inventors had, more or less, followed in the footsteps of Sir Humphry Davy. But finding this to be very bulky and difficult to manufacture, I struck out the idea, and worked with as little depth of gauze as possible. Seeing by experiment that gas levels itself round the gauze to the same depth as inside, and the gas exploding expands at a rapid rate, and passes the flame to the outside, I next tried to secure a better light at less cost by burning parafin and the application of a half-inch flat wick, and to do away with a pricker, securing the wick with a spring or ratch-wheel, so that miners could not tamper with the flame. This I arranged very satisfactorily, and secured a good light that would burn twelve hours without being altered, with cotton-wool inside the vessel so that the liquor would not squirt out to smear the lamp, But everyone that I consulted that was experienced in the science of chemistry condemned the use of parafin or any other mineral oil, and expressed a great surprise that inspectors allowed its use. I tried some experiments with it, and was satisfied with its use even where the temperature varies and reaches over 70 degrees Fahrenheit.

My next experiment was to lock it with springs and ratch wheels. I was some time in tonguing those, but found I could not get strong springs in a small compass, and found many ways to lock it, but none to unlock it without others doing the same. I next proceeded to unlock it with blockwork, as all my locks were arranged self-acting. I so completed it as to go twelve hours before it could be opened. Finding this rather complicated also, a lamp going out after being lit half an hour would have to be laid aside for eleven and a half hours before it could be opened for relighting. This threw me again into difficulty. I next commenced to work with a thin column of mercury, heating the lamp to a high temperature, so that the mercury would raise a float and release the spring to unlock the lamp. I relied on this for some weeks, but afterwards found that boys, or even men, might get a number of lamps together, and obtain the heat required, and thus open the lamps. But my present lock and apparatus have resulted from these experiments with mercury. I may say that should the lock prove a failure from any cause, I have other means of altering it and considerably increasing its strength, but slower in the movement.

I hope it will not be thought that I have been too lengthy on this all-important subject of reducing the death rate of British workmen, and showing a few simple facts on the construction of our globe, the skilful work of the atmosphere, the deadly mixture of gases that flow in streams through our mines when liberated, the dreadful scene of an explosion, the destruction and ruin, the need of good ventilation, the danger of the gauze lamps, the need of a better, and the advantages of my invention, and if I can only be the means of saving one of my fellow-workmen from the flames of an explosion, one from being dashed to atoms, one widow from bereavement, one mother from grief, one child from the pangs of hunger, one sister from the temptations of vice, one employer from ruin—I shall have done some little good, and accomplished that which I have laboured for, thus carrying out the highest purpose of my being. When my talent shall be required, my life may be crowned with the words of my Maker, "Thou hast been faithful over a few things, I will make thee ruler over many."

THE DIAMOND QUESTION.—In answer to Messrs. Jonas Bros., Mr. Hannay wrote to the *Times*, of March 1:—"Dear Sirs,—I do not in the least expect any discovery will have any effect upon your business, as the cost of producing very small quantities of substances like boart, is so great as to relegate the process to a mere laboratory experiment.—I am, &c.,—J. B. HANNAY.

Mr. Charles A. Righter, of New York city, has invented an improved card for use in putting up buttons for market. It is so made that several different styles of buttons may be attached to the same card in such a way that all or any desired part of either style may be detached without interfering with either of the others.

An improvement in apparatus for filling capsules, patented by Mr. Franklin E. Davenport, of Auburn, Ind., consists in a funnel, tube, and plunger. The funnel is flattened at one side to assist in taking up the material. The tube is adapted to receive the capsule, and is bevelled at its end to aid in placing the same, and the plunger is fitted with an elastic collar, which prevents it from being forced too far into the tube.

Mr. James Kerr, of Church, County of Lancaster, England, has patented an improvement in apparatus for guiding and delivering woven fabrics to cloth finishing machines. It consists in a peculiar arrangement of two conical rollers, by means of which every deviation of the fabric to the right hand or the left causes a deflection of a frame and brings into operation devices which arrest or retard one of the rollers, thus bringing the fabric back automatically to its central position.

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Crucibles.—W. R. Lake (com.)

Cruet, Liqueur, and similar Frames, Condiment Receptacles, Toast Racks, Egg Cups.—T. Miller.

Cutting, Sawing, Planing, Morticing, Carving, &c.—D. Marcon and J. S. Knott, J. Bethney, A. M. Clark (com), E. R. Dale, J. C. Ramsden, W. R. Lake (com), F. Knockferl and W. Fuller, A. J. Acaster, R. H. Tweddell, J. Platt and J. Fielding, B. J. Webber, E. A. Brydges (com), R. W. Taylor. R. Wyburn.

Cylinders and Rollers, Covering Rollers.—E. H. Waldenstrom and W. Sumner.

Disinfecting, Deodorising, &c.—J. H. Johnson (com.), J. H. Nelson and F. Somers.

Distilling, Bituminous Distillation, &c.—J. F. Flannery, E. Edmonds (com.), A. M. Clark (com.)

Drinking Vessels, Tumblers, Cups, Goblets.—W. H. Richards and H. Skerrett.

Doors, Gates, and Door Furniture.—T. Henderson, J. B. Cull & J. B. Fenby, C. J. Mazzetti.

Drying or Desiccating, &c.—W. Birch, A. Winward, A. M. Clark (com.)

Dyes, Dyeing, Bleaching, Cleansing Staining, Printing in Colours, &c.—S. Clift. J. King, J. H. Johnson (com.), S. W. Rich.

Earthenware, Porcelain, Terra Cotta, &c.—T. Bevington, W. R. Lake (com.)

Electricity, Galvanism, and Magnetism, and their Application.—H. J. Haddan (com.), G. Green, D. G. FitzGerald, C. W. Harrison, A. M. Clark (com.), J. Y. Smith, V. Poulet and E. Commelin, J. H. Johnson (com.). J. Perry.

[illegible] Light, Electric Lighting Apparatus.—[illegible], A. M. Clark (com.), J. Imray (com.) R. T. D. Brougham, A. M. Clark (com.), I. Graddon, J. H. Guest.

Electro-magnetic Engines.—J. Graddon, J. Perry.

Embossing, Producing Raised Patterns, &c.—J. James.

Excavating, Dredging, &c.—W. Bagshawe, Sir J. Coode.

Explosive Compounds, &c.—J. Pattison, E. Edmonds.

Fabrics, Elastic Fabrics.—J. H. Neave, B. J. B. Mills (com.), C. F. Leake, D. Dewhurst and S. Crossley.

Fans.—O. Thaege.

Felt, Felted Fabrics, &c.—W. A. Barlow (com.), J. Swallow.

Fences, Palings, &c.—J. H. Gillett.

Fibres (Obtaining and Treating).—F. C. Glaser (com.), W. R. Lake (com.)

Filters; Filtering, Purifying, and Clarifying Liquids, Distilling Water, Softening Water.—W. Spence (com.), H. Schomburg.

Finishing and Dressing Woven Fabrics, Yarns, and Threads, &c.—A. M. Clark (com.), E. de Pass (com.) T. Colman, T. Lancaster, J. Swallow, J. King.

Fire-Arms, Guns, Ordnance, Gun Carriages, Targets, Rifle Practice.—D. Bentley, W. W. Greener, P. T. Godsal, J. S. Heath, C. Groombridge.

Fire Engines, Fire Escapes, Extinguishing Fires, &c.—H. J. Allison (com.), S. R. Edwards.

Fire-Places, Stoves and Ranges, Fenders and Fire-Irons.—S. Suchet, S. C. Davidson, R. Roberts, F. C. Glaser (com.), W. R. Lake (com.), D. Dew.

Fireproofing.—T. Hyatt.

Fishing —R. Wright.

Floorcloth, &c.—A. L. Klein, C F. Leake.

Flowerpots, &c.—E. G. G. Thibault.

Flues, Smoke Shafts, and Chimneys, Chimney Pots and Cowls, Cleaning Chimneys and Flues. —T. Nutt, S. Suchett, A. Hancock and H. S. Heath.

Food for Animals, &c.—F. H. Greenstreet.

Furnaces and Fire-boxes, Supplying Furnaces with Fuel.—A. Hegener, T. Henderson, G. F. Redfern (com.), E. A. Brydges (com.). W. Jones and J. Walsh, S. & D. Thomas, P. M. Justice (com.), J R. Pickard, T. G Prideaux, F. C. Glaser (com.), T. W. Chapman, W. R. Lake (com.), J. H. Johnson (com.), G. W. Nawrocki (com.)

Furniture, Upholstery, Cabinetwork, &c.—W. E. Gedge (com.), W. R. Lake (com.), A. Thompson. W. H Richardson and H. Skerritt, J. Glendenning, H. Halstead, W. Fleming.

Games and Exercises Billiards and Bagatelle Markers and Indicators for Games.—W. Rushton.

Gas, Gasometers, Holders, and Retorts.—A. Hegener, C. Hegener, C. Harrison, A. P. Chamberlain, A Mackie. E. Edmonds, J. A. Stephen, W P. Thompsen, W. Foulis, A. M. Clark (com.), G. E. Stephenson.

Gas and other Burners, Gas Fittings, Lighting and Extinguishing Gas, Preventing Escape of Gas.—H. J. Haddan (com.), G. E. Webster and W. E. Fisher, J. A. Stephen.

Gas Regulators.—G. E. Webster and W. E. Fisher, J. McLennan und R. Owen, F. Wright.

Gems and Precious Stones —C. von Buch.

Glass and its Applications.—A. E. A. de Boutyre, J. H. Johnson (com.), W. W. Pilkington, W. R. Lake (com.)

Gloves, Gauntlets, Mittens.—W. E. Wiley, W. P. Thompson (com.), F. Horsepool, M. L. Muller and H. Hartzen, J. Hinks and T. Hooper.

Goffering, &c.—N. Wilson, T. Ashburn.

Governors for Engines and Machinery—W. R Lake (com.), W. Gibson and G. S. Nicholson, N. E. Nash, B. Alleyne, H. W. Cooke, H. H. Lake (com.)

Grain and Seeds (treating, &c.)—W. R. Lake (com.), E. Edmonds (com.), F. H. Engel (com.), A. C. Thompson.

Grinding and Crushing Corn, Grain and Seeds, and Dressing Flour.—F. Wirth (com.), W. R. Lake (com.). J. Griffiths.

Grinding, (Crushing, Pulverising, and Disintegrating Miscellaneous Substances.—F, C. Glaser (com.), A. C. G. Thompson, A. M. Clark (com.), H. J. Haddan (com.), W. Umpherston.

Grinding and Polishing, &c.—J. C. Ramsden, G. Little, W. W. Pilkington.

Hairdressing, Shaving, Pomades, &c.—J. H. R, Triscott, C. W. Rich.

Harness, Saddles, Curbs, Whips, Releasing from Harness, Grooming Horses, Nosebags.—W. H. Richards and H. Skerrett. C. Woolnough.

Hats, &c.—W. Richards and H. Skerrett, S. Holt.

Hay.—D. S. Newson, W. Nicholson and W. Maher, E. H. Tooley.

Heating, Warming, &c.—U. Skene, B. J. B. Mills (com.), S. C. Davidson, F. G. Hervey.

Hoists, Cranes, Capstans, Windlasses, Raising, Lowering and Moving Heavy Bodies, Raising from Mines.—A. M. Clarks (com.), H. G. Haddan (com.), J. and J. Shaw, J. Stanhope, J. Dunn, J. Foster and W. Brindle.

Hooks.—W. H. Richards and H. Skerrett, J. Foster and W. Brindle.

Horse Shoes, Shoeing Horses, Shoes for Animals, &c.—G. T. Mackley, J. Holt and G. Maude, W. R. Lake (com.)

Injectors, Ejectors.—G. W. Garrett.

Ironing.—A. Norris.

Jars, Jampots.—P. Pfleiderer (com.), W. W. Horner.

Jewellery, &c.—J. Candelent and G. Adams, J. Walker.

Knitting, Tatting, Crocheting, &c.—J. Bat'ney, A. Reddis (com.), W. Cotton, S. Thacker.

Knives, Forks, Table Cutlery, Knife Cleaners. —W. Scott, W. S. Guinness, W. R. Lake (com.), F. J. Walters.

Lamps, Lanterns, Chandeliers, Candlesticks, Lamp Furniture, Glasses and Shades, Lighting, Producing Light.—C. R. Mathews, C. L. Clarke and J. Leigh, H. J. Haddan (com.), I. Hynd, G. E. Webster and W. E. Fisher, F. W. Monck, A. E. Kagg, H. Defries, J. F. Hoyne.

Leather, Skins, Hides, Artificial Leather and Parchment, Currying, Tanning, Cutting, and Ornamenting Leather.—T. L. Alemand, R. Brown.

Leggings and Geiters.—M. S. Muller and H. Hartzen.

Life-buoys, Life Preservers, Rafts, Life-boats. —S. Chaminski, J. Sample.

Lime and its Compounds.—E. Solvay, W. J. Williams.

Locks, Latches, Bolts, Lock Furniture, Keys.—J. A. Thumling.

Magnesium.—J. Twyman.

Mangles —E. Taylor, J. Cherk, J. Willing.

Manure; Treating Sewage.—A. M. Clark (com.), W. J. Williams, J, Wadsworth. J. H. Johnson (com.)

Matches, Night Lights, Vestas, Tapers, &c.—J. Imray (com.), F. W. Monck.

Mathematical Instruments.—T. Morgan (com.)

Measuring, &c.—M B. Tetley.

Medicines, Drugs, &c.—T. Morgan (com.), A. M. Clarke (com.), J. W. Cousins.

Metal Waste.—J. H. Rogers.

Metals (Casting, &c.)—W. P. Thompson, E. H. Waldenstrom and W. Sumner, J. Crosthwaite, J. W. Macfarlane, R. B. Reed, H. and A. J. Bessemer, T. B. Whitfield.

Metals; Cutting, Planing, &c.—A. J. Acasra, R H. Tweddle, J. Platt and J. Fielding, A. Coventry.

Metals (Forging, &c.)—J. Shewell, W. R. Lake (com.), A. J. Abaster, R. H. Tweddoll, J. Platt and J. Fielding, G. Cotton and C. H. Smith, G. Little, J. Angus, T. W. Chapman, W. R. Lake (com.)

Metals (Plating and Coating, &c.)—J. C. Loeffler, J. H. Rogers, J. E. Reynolds, E. Parry and T. H. Cobley.

Metals (Smelting, Extracting and Reducing Metals, Heating Ores, Refining, Tempering, and Annealing Metals, Manufacture of Iron and Steel, Metallic Alloys, &c)—R. M. Moir (com.), S. Pitt (com.), J. H. Rogers (com.), H. and A. G. Bessemer, S. and D. Thomas, P. M. Justice, (com.), F. M. Lyte, H. and W. Wiggin and A. S. Johnstone. J. H. Johnson (com.), S. Pitt (com.), G. W. von Nawrocki.

Meters, Measuring Liquids and Fluids, &c.—D. Moulton, P. Hames, H. G. Haddan (com.)

Milk, Milk Cans.—W. R. Lake (com.)

Mining, Boring and Blasting Rock, Raising from Mines, Getting Coals, Draining, Lighting, and Ventilating Mines.—J. H. Johnson (com.), J. Aitken, W. R. Lake com.)

Mixing, Kneading, Mashing, Stirring, Agitating, &c.—A. Thompson.

Motive-power Machines, Obtaining Motive power.—A. M. Clark (com.), H. W. Cook, W. Ullmer, J. Walker, C. Menard, J. Casartelli and W. Potter.

Musical Instruments, Music, &c.—T. S. & W. W. Horn, J. N. Smith, C. Kessler (com.) C. D. Abel (com.)

Nails, Spikes, Bolts, Rivets, Screws, &c.—G. W. von Nawrocki, W. R. Lake (com.)

Needles, &c.—J. Darling.

Nuts and Washers.—J. F. Wil [illegible]

OILING or Lubricating, &c.—J. Mitchell, W. & S. Taylor.

ORNAMENTING, &c.—P. Pfleiderer (com.), T. H. Rees, O. Thaege, T. Bevington.

OPTICAL Instruments, Optical Illusions, &c.—S. Offenbacher, W. R. Lake (com.)

OVENS and Kilns.—A. Hegener, J. C. Mewburn (com.), G. Wray, W. O. Wood, H. Wedekind (com)

OXIDATION and Incrustation (Preventing and Removing).—J. W. Hannay.

OYSTERS.—M. Bauer (com.)

PACKING Pistons, &c.—A. M. Clark (com.)

PAINTS, &c.—S. Pitt (com), A. Annandale.

PAPER, Pasteboard, Papier Mache: Paper Hangings.—R. Brodie, A. M. Clark (com.), T. L. Alemand, W. Umpherston, A. Annandale.

PENS, Pencils, &c.—W. P Thompson (com.), W. E. Wiley

PHOTOGRAPHY and Photographic Apparatus, Pictures Portraits, &c.—J. Walfram, J. & W. J. Chadwick, J. M. Rogers, W Willis, W. R. Lake (com.)

PICTURES, Portraits, &c.—A. H. Richards and H. Skerrett, J. M. Rogers.

PIPES, Tubes, and Syphons: Joining Pipes.—J. W. Macfarlane, F. G. Henwood. A. M. Clark (com), G. Little, H. F. Stanley.

PRESERVING and Preparing Articles of Food.—W. R. Lake (com.), W. E. Gedge (com.), H. J. Haddan (com.)

PRESSES, Compressing, &c.—A. Sterne and J. M. Handyside, J. James, R. H. Tweddle, J. Platt and J. Fielding.

Printing and Transferring: Type and other Surfaces for Printing, Composing, and Distributing Type.—J. R Robinson, G. Pearce and E. Hughes, J. M Hepburn, S. H. Rees, R B. Reed, A. L. Klein, J. King. W. Willis, P, de Villiers.

PROPELLING Machinery, Transmitting Power, and Motion, Converting Movements.—C. A. Parsons and W. Cross, E. Wright, H. Palm (com.), E. Taylor, A. M. Blair and C Fairbairn.

PROPELLING Ships, Propellors, Paddle-wheels and Screws.—J. M'Lennan and R. Owen.

PUMPS, Pumping and Raising Water and other Liquids. Pumps. Pistons, and Packing—A. M. Clark (com.), W. Smethurst, G. Cotton and C H. Smith, G. W. Garrott, C. Shaw.

PUNCHING or Perforating.—J. Shewell, R. H. Tweddell, J. Platt and J. Fielding.

RAILWAY, Permanent Way, Rail Joints, Chairs and Sleepers, Portable Railways, Atmospheric Railways, Switches, Points, Crossings, and Turn-tables.—W. C. Homersham, G. Truswell, G. C. Barber, C. Wheeler, J. Reid, J. C. Mewburn (com.), J. Davidson, W. King, H. Wedekind (com), P. Black.

RAILWAYS, Carriages, Coupling, Uncoupling, and Altering Position of Carriages and Engines.—B. J. B. Mills (com.) W. P. Thompson (com.), J. Reid, C. T. Mazzetti.

REAPING, &c.—J. Howard and E. T. Bousfield, E. H. Tooley,

REFRIGATING, Cooling Liquids, Making Ices.—C. E. Young, E. L. Beckwith & T. B. Lightfoot, A. D. B. Douglass.

REGISTERING, &c.—F. Sage, F. Allcock, H. Johnson, F. T. Bond, J. B. Cull and J. B. Fenby, W. King, J. N. Maskelyne, A. Hilfiker, J. Casartelli and W. Potter.

ROADS, Paths, &c.—W. R. Lake (com.)

ROPES, &c.—J. Mitchell.

SEWING and embroidering.—E. F. Alexander (com.)

SCREENS.—O. Thaege.

SHIP and Boatbuilding.—J. B. Hannay, W. Shears, T. Britton, W. R. Oswald, G. Stavers, J. G. S, Anderson, M. Stuart.

SHIPS' Boats (Lowering).—E. Bond.

SHIPS' Cargoes (Loading, &c.)—Sir J. Coode.

SHIPS (Raising).—W. R. Mowbray and E. Murley.

SHIRTS, &c.—B. Mills (com.)

SIFTING, Sorting, and Separating.—W. R. Lake (com.), F. Wirth (com.), W. R. Lake (com.), J. Griffiths.

SIGNALS, Alarms, Communicating Apparatus, Conveying Sounds.—W. Smith, H. Morris, G. Edwards, S. A. Say, J. C. Mewburn (com.), T. Barrow, W. King, P. Black, C. E. Spagnoletti.

SOUNDINGS.—Sir W. Thomson.

SOUNDS (Producing, &c.)—R. H. Courtenay.

SOWING Seeds.—J. Scott.

SPINDLES, &c.—W. S. Taylor, J. Booth.

SPINNING and Preparing for Spinning.—J. Walsh and J. Farran, T. Coltman, I. Bailey, G. Tempest, E. Riley, W. & S. Taylor, J. Hendry (com.), J. Pollard, J. & J. A. Marsh, B. A. Dobson,

SPRINGS.—W. E. Wiley, E. Horsepool, L. Sterne and J. B. Handyside, W. Fleet, H. Smith, J. Hinks and T. Hooper.

STAMPS (revenue), &c.—H. Palm, J. R. Robinson, F. F. Bond.

STARCH.—E. Edmonds (com.), T. Lancaster.

STAYS.—W. P. Thompson (com.)

STEAM and other Boilers, Cleaning and Preventing Incrustation of Boilers, Water Feeding Apparatus for Boilers.—R Skene, T. Nutt, L. Varicas (com.), G. W. Garrett, F. J. Brougham (com.), J. W. Cook, E. H. McNielH. J. Haddan (com.). W. Clark and W. M. Swanson.

STEAM Engines (Stationary, Locomotive, and Marine).—F. W. Durham, J. Mitchell, C. Brown, J. Ramsbottom, G. Cranstown, S. W. Wilkinson, T. Presten and J. B. Hammond.

STONE, &c.—W. L. Wise (com.)

SUGAR and Syrups Glucose.—W. Morgan-Brown (com.), W. Spencer (com.), F. G Harvey.

SURGERY.—F. Wirth (com), W. H. Beach.

TEACHING, &c.—J. Stevens.

TELEGRAPHS; Telegraph Printing Apparatus.—J. H. Johnson (com.), W. C. Johnson and S. E. Phillips, W. Morgan-Brown (com.), J. C. L. Loeffler, R. H. Courtnay, F. H. W. Higgins, R. H. Courtenay, J. T. King (com.)

TESTING Liquids, &c.—J. Aitken, W. P. Thomp- (com.)

THERMOMETERS, &c.—J. W. Zambra.

THREADS and Yarns.—W. A. Barlow (com.)

TILLING and Cultivating, &c.—R. P. Parsons, B. Smith.

TOBACCO and Snuff, Cigars, Cigar-Holders, Pipe and Cigar-lighters, Smoking Pipes, Tobacco Pouches, &c.—W. B. Haas, R. Gottheil (com.)

TOOLS.—J. Angus, J. Walker.

TRAMWAYS and Tramway Carriages, Tramway, Locomotives.—W. C. Hamersham, J. Truswell, C. Wheeler. J. Davidson.

UMBRELLAS, Parasols, &c.—A. C. Henderson (com.), A. M. Clark (com.), S. Kott.

UPHOLSTERY.—W. E. Gedge (com.), W. H. Richards and H. Skerrett, J. W. Cousins, H. Smith.

VALVES, Taps, Stop Cocks, Plugs; Regulating the Flow and Pressure of Fluids.—W. Ross, D. R Ashton, A. H. Vernon, T. Adams, C. J. Waddell, R Smith, F. W. Durham, A. Gascoigne, J. W, Cull and J. B. Fenby, C. C. Barton, J. Ramsbotham, R. Schomburg (com.), P. Hames, W. Wilson, G. Cranstown.

VELOCIPEDES, Bicycles, &c.—W. Hillman, F. Allrock, B. Williams and D. Lougher, C. Wicksteed, A. T. Burton, T. Sparrow, A. Jennings, N. Salomon, T. M. Gubbin and J. Mangnell.

VENTILATION: Supplying and Purifying Air for Buildings, Mines, Ships, Carriages, &c—B. J. B. Mills (com.), H. Johnson. T. Sutherst, C. T. Mazzetti, A. Hancock and H. S. Heath.

WASHING, Cleansing, and Wringing Fabrics, Yarns, and Materials.—E. Taylor, J. Cherk, J. Wilding. W. T. Brown, W. R. Lake (com.)

WATER-CLOSETS, &c.—W. Ross, R. Smith, J. H. Johnson (com.), G. de Pass (com.)

WATER-POWER Engines, &c.—E. Wigzell and J. Bollet.

WATERPROOFING, &c.—J. Swallow.

WEARING Apparel, &c.—W. H. Richards and H, Skerrett, G Green.

WEAVING, Braiding, Plaiting, Preparing for Weaving.—D. Marcon and G. S. Knott, E. Hollingworth, T. Blackhurst, J. Imray (com.), C. Cross, A. C. Henderson (com.), G. Garstang, G. F. Dawson, J. Myers and J. Smith, J. Poole, J. Taylor.

WEIGHING, &c.—M. B. Tetley.

WHEELS for Carriages, &c.—C. Wicksteed, G. Cotton and C. H. Smith, G. Glossop and E. J. Cavill. H. Wedekind (com.)

WINDING Threads, &c.—K. H. Cornish, A. C. Henderson (com.), W. Greatwich.

WINDOWBLINDS, &c.—W. H. Richards and H. Skerrett.

WINDOWS and Sashes.—C. Causley, H. Brittain, C. T. Mazzetti, T. Hyatt.

WIRE, Wire Working, &c.—J. Mitchell, J. H. Johnson (com.), J. C. L. Loeffler, G. Edwards, J. T. King.

WOOD and Veneer.—T. L. Alemand.

YEAST.—W. R. Lake (com.)

ZINC (Salts and Oxides).—S. Pitt (com.)

⁂ *The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.*

RECENT AMERICAN AND FOREIGN PATENTS.

AN improvement in apparatus for drawing and preserving malt liquors, patented by Mr. John Neumann, of New York city, is designed for the purpose of drawing malt and other liquors from a barrel or other vessel, without the admission of air or gas thereto, so that the liquor remaining at any time in the barrel will be prevented from becoming stale.

An improvement in speed-accelerators has been patented by Mr. James Schofield, of New York city. The object of this invention is to convert slow or slight motion into rapid or extended motion by the intervention of ropes or chains and sheaves for the purpose of propelling boats, vehicles, machinery, and the like. The invention consists, essentially, of a sliding carriage containing several sheaves, and fixed on a reciprocating rod, while over said sheaves and sets of corresponding standing sheaves fixed opposite, and at a distance a rope or chain is passed back and forth in such a manner that a slight movement of the carriage will produce a very extended or accelerated movement of the bight of the rope or chain, or of objects attached to it.

An improvement in vehicle-wheel hubs has been patented by Mr. Lucius S. Edleblute, of Cincinnati, Ohio. This invention is an improvement in the class of metal wheel-hubs in which the spoke tenons or butts are clamped between flanged collars, one of which is adjustable on the axle-box to adapt it for convenient adjustment or removal, and it pertains to a peculiar construction and arrangement of parts which cannot be clearly described without an engraving.

Mr. Benjamin Slusser, of Sidney, Ohio, has invented an improved elevator for warehouses and other buildings, constructed with a view to securing greater safety against the sudden fall of the elevator platform from the breakage of the rope, and to provide against persons falling through the hatchways in the several floors. The invention consists in a novel automatic clutch for arresting the descent of the platform in the event of the sudden breakage of the rope, and in the peculiar means for opening and closing a set of automatically operated trap doors for the hatchways, which are opened above and closed after the platform in rising, and also opened below and closed above the platform in descending, so that at no time is the hatchway left open.

Mr. Lovren E Hogue, of Sandy Lake, Pa. has invented an improved injector in which the lifting and forcing tubes are so constructed and arranged with regard to each other that the pressure may range from forty to one hundred and fifty pounds without requiring any change in their adjustment, the said construction and arrangement enabling the quantity of water to be so graded that three or more different quantities of water may be injected into the boiler.

An improved implement which will hold a rope or chain attached to the hook firmly and securely has been patented by Mr. James Robertson, of East Cambridge, Mass. It consists in a hook formed of the screw shank, and provided with a cylindrical nut made with an enlarged lower end, the hook arm having a grooved cavity or slot in or through the arm longitudinally in its upper or inner side, the eye, and the head.

An improvement in watch regulators, patented by Mr. Aloys Platt, of New York, is designed to provide a means for more easily and accurately moving and adjusting the regulator lever of a watch. In consists of a screw set upon the regulator lever and engaging in a screw groove made in the regulator bridge, so that by turning the screw the lever may be easily and delicately adjusted.

Reviews.

DR. COLLYER'S RHEEA FIBRE MACHINE.

"Rheea Fibre and Dr. Collyer's Patent Rheea Machine, with extracts on Mode of Cultivation." By Dr. J. Forbes Watson, M.D., etc. Allahabad: Printed at the Pioneer Press. 1879.

In this pamphlet Dr. Collyer gives much information as to his mode of treating Rheea fibre. Perhaps it will be the best course to allow Dr. Collyer to speak for himself.

In the year 1870 the Government of India offered two prizes, one of £5,000 and the other of £2,000, for the two best machines which would separate the bark and wood from the fibre of the Rheea or China grass plant. The Government of India advertised this notification most widely in Europe and America. In 1872 only one person presented himself at Saharanpur whose machine failed to meet the requisitions required. The prize offered was renewed in August, 1877, the competition to take place at Saharunpur on 15th September, 1879. Some twenty-four persons entered the lists from the United States of America, Java, France, England, and India. On the 15th September only ten *bona fide* competitors were on the ground. The trials commenced on the 22nd of September and ended on the 8th of October. The subject of treating fibres has especially engaged my attention since the year 1856, when I took out several patents in England, France, and United States for the conversion of vegetable fibres into paper material, or what is technically known as "half stuff." My success was so great that at the great London International Exhibition of 1862 I was awarded the only medal. The following letter from one of the most distinguished of the then living chemists, Baron Justus von Liebig, will show the value of my invention :—

> "Your important discovery relative to the conversion of straw and other fibrous substances into pulp capable of being converted into all kinds of paper has captivated my attention. I am satisfied that you have accomplished the much-desired object of obtaining a substitute for rags in the making of paper. The simplicity of your beautiful process renders your important discovery most precious, and I hope you will reap the reward of your labours.—With much friendship, I am, my dear Dr. Collyer, ever yours,
>
> "Justus v. Liebig.
>
> "To Dr. R. H. Collyer, Beta House, St.
> "John's Wood, London, June, 1859"

Baron Liebig, at the Congress of Chemists held at Carlsruhe, Baden, 1859, publicly presented me a handsome souvenir as to the estimation my discovery was held in by the eminent chemists present. In 1867 I exhibited a case of some twenty different fibres in different stages of preparation at the Paris International Exhibition, and was awarded the only medal. The announcement of the Government of India in 1870, that they were prepared to give £5,000 and £2,000 prizes, claimed my serious attention. Dr. J. Forbes Watson, of the India Office, London, supplied Rheea stems sent from India in the dried state to those who were disposed to turn their inventive talent to the discovery of a method of cleaning the Rheea fibre. Early in 1872 I had conquered the difficulty as regards the treatment of the dried stems, and sent specimens of my work to the India Office, which are now in the Museum at the Botanical Gardens, Saharunpur. So satisfied was the Government of India of my success that on the 3rd of January, 1873, a special dispatch was sent to London to have my machinery fully tried. (*Vide* report on the preparation and uses of Rheea, by Dr. Forbes Watson, 1875, page 2). The Government of India made it a condition that the prize was only to be given for a machine which would treat the Rheea in the fresh or green state. Those inventors who, like myself, had not the opportunity of obtaining the stems in the fresh condition, were placed to a great disadvantage, as it is next to impossible to make machinery to treat a condition of material not within the reach of being experimented on. Until I arrived at Saharunpur, a few days prior to the recent trials, I had no opportunity afforded me of acting on the green or fresh stems of the Rheea plant. In 1868 I had occasion to devote my attention to the improvement of machinery for the dressing and preparation of flax. Finding the existing machinery most defective in breaking the "shive" and softening the fibre prior to scutching, I invented an entirely new machine, for which, at the Great International Exhibition held at Lille, France, the large silver medal was awarded me ; but, for a defect on the part of the manufacturer of the machine, I would have had the gold medal. I subsequently had a machine made by Messrs. Lawson and Sons, Leeds. This I sent to Ireland in 1870, and at the Royal Agricultural Show was awarded the only prize medal. In 1872, at the International Exhibition held in Moscow, where all kinds of flax machinery was in competition, the jury unanimously awarded my invention with the grand gold medal and Diploma of Honour. My machinery was exhibited in Belgium in September, 1872, and obtained the gold medal. In 1873, at the Great International Exhibition held in Vienna, I received the Grand Diploma of Honour ; and also for my case of Rheea fibre, in every stage of preparation, the jury awarded me the medal of merit. With this brief history of my invention, you will be prepared to understand that I brought to India the only available machine at my disposal, a small hand flax-breaker, which I most fortunately had adapted to work by steam power. For this I am deeply indebted to the valuable aid received from Mr. R. Alexander at Saharunpur, engineer to the Scinde, Punjab, and Delhi Railway.

This small machine when worked by steam really astonished me, as it acted on 300lbs. of Rheea stems per hour, and removed the bark and saved the whole of the fibre. It is self evident to anyone who will take the trouble to reflect that any machine which depends on scrapers, knives, or scutchers must necessarily lose a large percentage of fibre. As these drag away the bark, with it much fibre is lost. The Rheea stem on being peeled, so as to apparently remove the fibre and the bark, still retains a large portion of fine fibre attached to the woody matter ; this must also go with tow and waste refuse if knives, scrapers, or scutchers are employed to remove the bark. My machine, having a beetling and rubbing action, accounts for the large percentage I gave over every other competitor at the recent trials at Saharunpur. Out of one ton of stems fresh cut I obtained 147lbs. of clean fibre, or over 6½ per cent., whereas no others obtained anything near so large a yield for the reasons already stated.

The difficulty I found in using the small machine was that it did not have sufficient capacity to do quantity, and, besides, the fibre had to be passed twice through the machine after being dried. The large machine, which I have ordered to be made especially for the treatment of Rheea fibre, will not only obviate all the apparent imperfections—solely arising from want of size—which the small machine possessed, but will operate in a most efficient manner on one ton of Rheea stems per hour, cleaning them of every vestige of bark or woody matter, and also removing a large portion of the gummy and resinous substances attached to the fibre ; in fine, solving in a large practical commercial scale the long-sought problem of successfully treating the Rheea or China grass fibre. I expect that as the machine is being made by the eminent mechanists, Messrs. Lawson and Sons, of Leeds, that those interested in the cultivation and preparation of this valuable fibre will be much gratified in witnessing the machine at work, of which due notice will be given on receiving invoice, which is expected early in February next. I am firmly convinced that the fibre prepared with the large machine will have an average value of £70 per ton in the English and other European markets. I can show that at least £45 clear profit can be made by the cultivation and treatment of the Rheea fibre for exportation from India.

With this object in view, I have determined to form a company in Calcutta to work the invention on a large practical scale, with a capital of £100,000.

The Government of India granted me a patent for the preparation of Rheea, jute, and other fibrous substances on the 26th of October, 1875. The machine, there specified, "demands the use of deeper flutes, and also, when necessary, steeping in boiling water for two hours or more in order to more readily remove the bark." My late experience has enabled me to perfect in detail the machine, identical in principle to the one patented in 1875.

MINING IN NEW SOUTH WALES.

"Mines and Mineral Statistics." Annual Report of the Department of Mines, New South Wales, for the year 1878. By Authority. Sydney: Thomas Richards, Government Printer.

This is a work that puts the mother country to shame, for it is no bloated specimen of red-tapeism, such as some of our larger Blue-books, but a book of interest to all concerned in the progress of mining, well illustrated with maps and plans.

To give any reliable view of the contents of such a work is well nigh impossible ; but the following quotation will, we hope, be found to afford good indication of the nature of the work :—

> It is a matter of congratulation that, notwithstanding the yield of gold, which was a few years ago the great mineral production of the country, has considerably decreased, the total value of our mineral productions for the year 1878 remains much the same as that of past years, being above the average value of the last ten years by about £40,000. This result is chiefly due to the increased yield of coal, which has steadily grown, year by year, till out of a total mineral production in the colony for the year 1878 valued at £2,172,000 it reached in that year a value of £921,000.

It is also satisfactory to learn that, as regards other minerals and metals, such as shale, copper, and silver, in which the colony is now proved to be very rich, the production is somewhat greater than in previous years, notwithstanding that the price of one of these metals, viz., copper, keeps at a very low rate.

As regards the production of gold, it may be anticipated that ere long this great branch of our mining industry will revive. There is always the great probability existing of new gold fields being discovered, particularly in that vast unprospected country lying at the west and north-west of the colony; and, in addition to this, the gold miner is now successfully working auriferous reefs at depths at which it was thought some time back improbable, if not impossible, that payable gold could be obtained.

The continued annual yield from our various mines of over two million pounds' worth of metals and minerals is a circumstance of which so young a country as New South Wales may well be proud; particularly when it is considered that this amount is derived not wholly, or even in a great degree, from a metal so uncertain in its yield as gold, but from a variety of other valuable metals and minerals. It may be reasonably anticipated that a great expansion must take place in the production of such vast mineral treasures as the colony possesses, when the improved mechanical appliances are brought into operation amongst us which are now so much in use in many of the old countries of the world, and when the capitalist becomes alive to the great wealth which can be obtained by the investment of his money in legitimate mining enterprises.

The establishment of a separate department of the Government to superintend generally the mining affairs of the country, presided over by a responsible Minister, and having its staff of scientific men and skilled officers, is beginning to exert a salutary effect on mining enterprise. The valuable collection of mineralogical and geological specimens in the mining museum—the assay of ores and metals which can always be made free of cost to the public—the geological surveys made and the scientific information ever being afforded by the Government geologist and his assistants—and last not least, the information on the mining laws, and instruction as to the best and most rapid manner of obtaining a secure holding of mineral land which are accorded to those who ask, by the Under Secretary for Mines—all urge on the path of progress the miner and those taking part in mining ventures.

It is to be hoped that in the future the Mining Department may be of more utility to the public in furthering mining enterprise than it has ever been in the past. Much may yet be done to assist the working miner and to give security to capital by judicious amendments in our mining laws, by affording reliable information on the important subject of water supply to mining districts, and by directions from scientific men on the treatment of ores and minerals. The Legislature has hitherto shown considerable liberality in the establishment and maintenance of a Department of Mines, in the hope, doubtless, that it would tend to the increased production of our mineral resources; and I cannot but express my confidence that it will be proved in the future that Parliament took a wise course in following the footsteps of other countries in the establishment of such a department, and that its maintenance will give a great and continued impetus to the development of the vast mineral wealth which in New South Wales now—to a great extent—lies dormant awaiting additional enterprise and capital.

The value of the tin and copper raised up to January, 1878, is stated to have been £48,613,136 11s. 4d.

CASSELL'S SERIALS.

We are glad to find we have space left to observe that Messrs. Cassell's serial, "Great Industries of Great Britain," "Dictionary of Practical Engineering," and "Science for All,' still proceed successfully and judiciously."

REVIEWS POSTPONED.

⁂ We are compelled to pospone several important reviews.

THE EARTH COLUMN.

This invention—an explanatory statement (illustrated by accompanying drawing) received from Mr. George Barnard, of Edinburgh, has reference, it is stated, to a new or improved mode, or means and appliances, for removing and separating organic matter and salts from urine, and all fœcal matter from the sewage discharged from water-closets or other waste pipes in dwelling-houses and other buildings, and also for purifying or treating the sewage of towns and villages; which improvements will promote the health of cities, towns, and villages, by preventing the escape of deleterious gases into the atmosphere, or any sewage matter into rivers or other watercourses, whilst the whole of the salts and organic matter, both of urine and fœculent matter, are reserved for the use of the agriculturist.

The sewage from the soil-pipe of a water-closet or other waste-pipe is discharged by a pipe or tube passing down and through or outside the wall of the house into a cylindrical iron receptacle of any convenient size (say of about four or five feet high, and about eighteen to twenty-four inches in diameter), through an open mouth in the cover of the latter, into which the pipe passes, and is made air-tight by a rubber ring fitted round it in the neck of the cover. The cover of the receptacle is of lead of conical shape, and is also made air-tight, either by a rubber ring fitted between the cover and the vessel, or by a water-joint formed by the cover dipping into a groove containing water in the upper edge or rim of the receptacle; or this groove may be stuffed with earth. The iron receptacle or vessel is perforated at the bottom and filled with fresh earth to the depth of about eighteen inches, so that the sewage in passing through it has the fœcal and solid matter separated and retained above the earth, whilst the liquid portion sinks or filters through the earth and through the perforations at the bottom into a second vessel, preferably of earthenware, and of about the same dimensions as the first, on which the iron vessel rests, and for which it forms a cover, held air-tight round the outer edge by a rubber band or ring, or the iron vessel should rest on the rubber ring; or by a water-joint or earth stuffing, in the same manner as the top cover. This earthenware vessel is also partly filled with earth, but to a slightly greater depth (as about two feet), and is also perforated at the bottom; and the liquid sewage passing through the earth in this vessel is further filtered, a residue of solid organic particles being retained or absorbed by the earth, and some of the volatile matter and salts and organic matter of urine also.

The liquid sewage passes through the perforations in the vessels into a further series of about four or five such earthenware vessels, placed in a tier each below the other, and containing earth varying in depth from about two feet in the upper vessel, immediately below the iron receptacle, to about three feet or more in the lowest, and fitted with air-tight joints between them, as already described; and the fluid portion of the sewage passes from the lowest vessel in a purified and almost clear state, free from organic matter, either directly to a common sewer, or into a small cistern discharging into a sewer, and having a stop-cock and tap for drawing off a portion of the liquid at intervals, for the purpose of testing the water and the efficacy of the filtering vessels.

The cover of the upper iron receptacle is made to slide air-tight up and down on the discharge pipe leading from the water-closet, so that the receptacle can be removed from below it, and a narrow slit is cut halfway round near the upper edge of the receptacle, and covered air-tight with a rubber flap or valve fitted to the inner side, so that a circular iron plate or flat lid may be pushed into and cover the contents of the receptacle before lifting the cone-shaped permanent cover, the flat plate fitting securely into a groove or having catches to fasten it.

The iron upper receptacle collects the solid contents of the water-closets or waste-pipes, and on removal another similar vessel charged with about eighteen inches of fresh earth, is fitted in its place, and the cover lowered and again closed air-tight.

The impure air and gases which generate in the iron receptacle at the top of the tier are, by preference, conducted by an exit pipe to the bottom of a long metal box, which may stand on a bracket fixed on the wall of the house, or other convenient situation, and this box is filled with charcoal to absorb the deleterious gases which pass through it, and the purified air escapes by a tube or opening at the top; or the gas pipe may be connected from house to house, and conducted to a distance, and the gases burnt in a small furnace as they escape, or they may be utilised.

The whole tier of earthenware vessels and the iron receptacles may be fixed to the side of the house or building, and they may be encased in a tower of brickwork, or may be made to represent an ornamental column. And the contents of the closets of several flats of dwelling-houses, or of hospitals, or other institutions, may be led to the receptacle at the top of the tier without any gas being allowed to escape; the water-closet traps inside the houses, and the air-tight fittings between the conical cover, and between each vessel, effectually preventing any outlet of impure air or deleterious gas, and the earth in the vessels absorbing all organic matter from the fluids that pass through them.

If there are water-closets on the basement storey of a house, the tier of earth filters must be sunk in a well below the basement storey and outside the house.

The removal of the upper iron receptacle would probably be required about once a week in ordinary private houses, and daily from houses accommodating several families, or in the case of one receptacle and tier of filters serving several houses. The upper earthenware vessel would only require to be removed and replaced once in two months or thereby, the next lower about every four months, the following one about twice a year; and if there is still a lower vessel, that might be removed and replaced annually. The earth in each one of these earthenware vessels will be fully charged with ammonia, phosphates, and urates, &c., before removal.

These deep filtering receptacles, removed as described from each tier or column of earth filters, with their close slides or covers applied to prevent the escape of gases, are preferably by special improved arrangements transferred to the country in their vertical position, either placed on shallow trays, or in a liquid tight box cart or waggon, which would retain any liquid filtering through the receptacles, thus preventing waste or loss in their transit. But a time should be chosen for removal—say, early morning, when the contents of the iron receptacles are nearly dry.

These carts or waggons should be specially constructed for arranging the deep receptacles compactly and steadily in upright rows, for which purpose the waggon would be made very low, with deep sides and kneed axles, so as to admit of the use of large wheels, and of convenient loading and unloading of the deep receptacles in their vertical position; and the same waggon would serve the purpose of bringing back the clean vessels with filtering earth renewed, all in a vertical position, ready for re-application as hereinbefore described.

Ordinary common loams will answer every purpose; very stiff clays would not filter quickly enough.

Severe degrees of frost must be provided for by coverings, or sinking the columns in dry wells, though decomposition by vital action in the earth contained in the filters may generate heat sufficient to counteract the effect of extreme cold.

There should be small overflow-pipes opening near the top in each vessel, and leading to the one below.

The charcoal-box might be dispensed with, but there must be a small gas-pipe leading to the top of the house.

In crowded cities the "Earth Column" should be sunk in a well, and communicate with sub-railways. These sub-railways are not included in patent.

This plan can be introduced into towns, by degrees, one street, or part of a street, may adopt it; twenty average four storeyed houses would produce a load for one waggon once a week or oftener. The cost of carriage would amount to considerably less than five shillings per head of population per annum.

KOPF'S EXTRACT OF MEAT.

The *Times* recently observed with regard to the products of Kopf's Extract of Meat Company, Limited:—"Kopf's consolidated preparations, which were used with signal success in South Africa, supply a long-felt and much-needed want. What traveller has not felt grateful to Liebig for his extract of meat, or to our own high-class firms whose tinned provisions have often proved a substantial addition to meagre fare in distant lands? All these were beyond the reach of the private soldier, were expensive and bulky. Kopf's preparations are inexpensive, they are nutritious, and are extremely portable. In Zululand our soldiers spoke most highly of them, and even in England they are not despised in the barrack room. A small tin cylinder weighing but 1¼oz. contains ample for a meal; three of these among two men are all a soldier requires in the day Soups of various kinds, containing compressed vegetables in greater or less quantities, are the preparations most appreciated; but compressed tea, milk, and sugar are luxuries which campaigners will not pass by Three minutes' boiling in a soldier's canteen is all the cooking necessary for a meal. It certainly seems extraordinary that in the face of the unqualified approval bestowed on the compressed food by both officers and men in South Africa more efforts have not been made by Government to introduce it in Afghanistan. Had General Gough been provided with a supply of these provisions, there need have been no delay for want of transport or supplies. One mule can carry 2800 tins of Kopf's soups, or rations for a whole battalion for a day, a camel can in like manner carry over rough ground more than two days' rations. Each man without much difficulty could slip a supply for a couple or three days into his haversack. Here, then, we have the whole secret of waging war with minimized transport, and consequently at a reduced expenditure. It is not that these compressed foods should supersede the ordinary rations; but on certain occasions when light marching order becomes necessary, their introduction would be attended with the most valuable results, and would make the general practically independent of transport or of the country through which he was marching. How many flying campaigns into the hills would have been successfully conducted at a tenth of the expenditure incurred had the invention been known when first we annexed the Punjab! A reduced transport train means reduced baggage guards, extra rest to the men, and finally enables us to move with smaller forces. It will be argued that, however valuable such food may be for our own British soldiers, the caste prejudices of the natives will prevent their ever agreeing to its introduction There is no reason why the staple articles of diet used by the Sepoys should not be similarly compressed, and under the superintendence of their own cooks; rice, dhal, ghee, vegetables, all and each of them may be operated on in the same manner as pea-soup and Scotch broth; intelligent native officers will not be found wanting who will readily agree to the advantages claimed by the inventors. . . . The question of transport is one which affects our Government in no small degree, and anything which promises to lighten the vast sums incurred on this head should at any rate receive an honest, impartial trial"—Similar expressions of opinion will be found in the *Broad Arrow*, *May Fair*, *Army and Navy Gazette*, *Bullionist*, *London Figaro*, *Whitehall Review*, *&c.*

NEW COLOURING MATTERS.

The new acid green, we learn, can be used for wool by dyeing with oxalic acid in the dye bath. On cotton it is dyed by mordanting first with sumac over night, then passing through tartar emetic, and dyeing in a tepid bath with the necessary amount of colouring matter. On calico it is printed with tannic acid or sumac extract, like methyl green; it is then steamed and, we understand, passed through tartar emetic. The acid green has the advantage that it does not run in steaming if used in connection with picric acid, a fact of great importance in printing; and furthermore, it resists the action of the heat without losing its shade. To print on wool, take 2½ gallons boiling water for 1 lb. green; filter and add 2½ gallons gum water and 3 lb. glycerine

The Austrian firm, Przybran & Co., patented some time ago the production of a sulpho-derivative of alizarine and purpurine under the name of alizarine carmine, which they have now introduced into the market. The new colouring matter is used for dyeing wool, and is recommended as a substitute for madder in all its applications for wool dyeing. It is said to give nicer and purer shades. The alizarin carmine dyes wool of a red colour when the latter is mordanted with tin crystals of alum. The sulpho-acids form salts with different bases. The alum salt can be used direct for dyeing wool; however, it is better to use the soda salt on previously mordanted wool by adding tartar to the bath. Different shades are obtained with different mordants

We see in a foreign contemporary that the firm of Guinon, Jne., & Picard, in Lyon, have lately brought out a product under the name of hematine (hæmateine) a derivative of logwood. Hemateine ($C_{16}H_{12}O_6$) is formed from the chromogen of logwood, or hæmatoxyline ($C_{16}H_{14}O_4+3H_2O$) by treating it with ammonia. By this reaction hemateine-ammonia is formed, which gives hemateine either by evaporation in vacuo or by boiling with acetic acid. Hemateine forms in this case a brownish red, and almost black precipitate, which assumes when dry a greenish metallic appearance like that of some of the aniline colours. When sharply ground and passed through a sieve it takes a redder colouration. It is soluble in water, alcohol, and ether. Hæmatoxyline is with hæmateine the colouring substance of a solution of logwood, which contains as well all the soluble substance of the dyewood. Hematoxyline gives with ammonia næmateine; the latter is also formed by sprinkling logwood with urine and by fermentation. The product has already been known for a considerable time; its cost, however, was so high that it precluded its application in dyeing, but the above firm have discovered a process by means of which the hæmateine is obtained much more cheaply than hitherto, and the product has already found its way into the dye houses of France, Switzerland, and Austria, to such an extent that 2,000 kilos. are daily produced in the works of Messrs. Guion, Jne., & Picard, and they are making alterations in order to more than double their output. The brownish black product is completly soluble in water like logwood; it dyes blue blacks, and does not rub off; 15 kilos. hæmateine are said to be equal to 100 kilos. best logwood, over which it is said to possess great advantages, as well as over logwood extracts.

Cauline.—Messrs. Savigny & Collineaux have exposed, in an Exhibition of Science as applied to Industry in Paris, samples of *Cauline* (the dye from cabbage) in powder, for solution in the dye bath, and as violet, lilacs, blue and green lakes, and as cauline black for leather dyeing The two colouring matters, alneine and ericine, we alluded to in our October issue, have also been exhibited in powder, solution, and in paste; the latter also as dry lakes for calico printers and paper stainers

The alneine can be employed instead of cachou in all its applications. On silk, wool, cotton, and jute it is said to give brown, salmon, and mouse gray shade, which are especially beautiful on jute; the shades are of great brightness and solidity, resisting chlorine and any amount of washing.

Cauline, which is extracted from red cabbage, is prepared dry or in syrupy extracts. On wool grayish colours are obtained, varying from silver grays to dark slate. Grayish and gray lilacs, as well as moss greens, can be obtained by cauline without the aid of any other dye stuff. Every metallic salt gives a different but constant shade with cauline, so that by using different mordants several shades can be obtained by dyeing in the same bath, and this latter can be kept and used for a considerable time Wool dyed with cauline has great affinity for indigo, and very dark blues can be obtained by first dyeing with it, and then adding carmine of indigo to the bath.

On cotton the mordants used for wool give exactly the same shades when used with cauline, a fact of great importance in dyeing mixed goods. Used alone, it gives on cotton a violet and a peculiar blue shade, called cauline blue. For furniture articles, those of jute especially, it is reported that the three colouring matters we have described will be found of very great advantage either for dyeing or printing. Further, from cauline a black extract can be produced, which dyes leather blue black. Besides these colouring matters, Messrs. Savigny & Collineaux exhibited at the same time a great variety of tasteful patterns dyed with their new products.—*Textile Manufacturer.*

Mr. Thomas G. Brown, of New York city, has patented improvements in the construction of combination lock bracelets, the object being to enable the lock-bar or staple to be entered into the socket of the lock when the two parts of the bracelet are pivoted together, and it consists in connecting the lock-bar or staple with the end of the bracelet opposite to that on which the lock is placed by a concealed pivot, so that when the two ends are brought together the bar will turn sufficiently to enable it to enter with ease the straight socket in the lock.

BRILLIANCY IN LIGHTING.

On Thursday, February 26th, Mr. J. Cadett, read a paper at a meeting of the Inventors' Institute, "On Brilliancy in Lighting," especially as regards the use and misuse of the lime light, in which particular reference was made to various improvements in lime-light apparatus. Admiral Selwyn, Vice-President, occupied the chair. The lecturer said that the limelight was rather of ancient date. It was first used in 1820, and since that time, with the exception of new appliances for facilitating its use, we had made no very great improvement in it. It was to be hoped that in time we should learn how to extract oxygen from the atmosphere easily, when the electric light would not be able to compete with the limelight. For the purpose of testing colours of silks and stuffs, the limelight was immensely superior to gaslight. The lecturer explained the improvements which had been made of late years in the apparatus for making the limelight, and said that now the fear of accident was reduced to a minimum. A few general remarks concluded a very interesting lecture. Mr. Steward, the well-known optician, then exhibited a number of experiments with his improved lantern, the effects being very good. The apparatus used by Mr. Steward in illustrating Mr. Cadett's lecture, comprised—the Bridgman triple lantern with recent improvements of the mechanical arrangements for producing rolling-up view and curtain effects; a combination of chromatic lenses to produce six different sized discs at the same distance from the screen, the same size disc at six different distances; improved combination or interchanging jets to use with high pressure mixed gases, or as a "separate" (whether oxygen is used in the bag and the hydrogen from the main) by simply removing a collar and fitting in a different nozzle; telescopic adjustment to front tubes to get necessary length. Mr. Steward, it was stated, was the original designer and introducer of the triple lantern in an upright form suitable for working by one operator, and obtained a registration in the year 1874. Besides the above. were also shown: Chadwick's improved generator and oxygen gas holder; Chadwick's safety valve to prevent the return of gases, and modified double purifiers and interceptors (Mr. Highley's).

FRESH MEAT FROM AUSTRALIA.

Not long since, a number of visitors assembled by invitation of the firm of McIlwraith, McEacharn, and Co., Leadenhall-Street, on board the "Strathleven," one of the Burrell & Son's line of steamers, now lying at the west quay, East India (Import) Dock, London, to inspect the "meat room" and the machinery, and to practically judge of the experiment of the practicability of bring fresh meat by the freezing process from Australia, the first consignment of which came by this vessel.

On November 29th the vessel left Sydney, having on board 55 carcasses of beef and 357 carcasses of mutton. She proceeded to Melbourne, where an addition was made to that portion of her cargo by the shipment of 5 carcasses of beef and 205 carcasses of mutton, the total weight being from 30 to 33 tons. The "Strathleven" is 1,588 tons register, 2,436 tons burden. She left Melbourne on December 6th, passing through the Suez Canal, and arrived at London on Monday, February 2nd. The whole of the meat must therefore have been killed about two months since. The chamber in which the carcasses were stored is about 26 feet square, and 6 feet 6 inches in height, and connected with it is an engine fitted with refrigerating apartments, the air being drawn out of the room, compressed, and chilled, and then forced back again through about 300 feet of piping. By these means an average temperature was kept during the voyage of from 10 to 15 degrees of frost; on Friday, although until the middle of the day the engine had not been at work since Sunday or Monday, the temperature was 23° Fah. About 3 tons of butter were also brought over in the same department. The vessel was 23 days in the tropics, and in the Red Sea the temperature was from 72° to 74°, but no difficulty was experienced in keeping the "meat room" at 12° of frost. It was not found necessary to have the engine constantly at work, and no chemicals were used

After the inspection, the company sat down to luncheon, which consisted almost entirely of Australian fresh meats which had been brought over in the "Strathleven." The *menu* comprised lamb cutlets, beef olives, stewed chops and asparagus, minced collops, roast beef, mutton, and lamb, boiled mutton, and corned beef.

The Premier of Queensland (Mr. T. McIlwraith), said it was the immense undeveloped resources of that colony which prompted the chairman to try the experiment of which the success had been proved that day. About £5 per head had been paid for the bullocks, which would have cost £28 or £30 per head in England. He referred to the immense capabilities of New South Wales and Queensland for producing meat, and expressed the belief that in the future a great trade would be developed. They could produce meat and sell it at a profit of 2d. per lb., and he had no doubt it could be placed before the British public for 4d. per lb.

Mr. A. McIlwraith, in responding to the toast of his health, said that the meat was purchased at about 1½d. per lb., and was expected to realize 6d. to 7d. in Smithfield Market He hoped that in a short time he would be able to collect such information as would show that this meat could be imported on a much larger scale. If they could bring from 100 to 150 tons per week to England, it would relieve the surplus produce of the Australian colonies. Mr. T. McIlwraith next gave the health of Mr. James Campbell, C.E., who, he said, had really carried out the details of the experiment.

Mr. Campbell said that although fears were entertained for the success of the enterprise before they reached the tropics, no difficulty was experienced in passing through those regions, and he should have had no fears for the success of the experiment, even if a temperature had been experienced of 90°

AUSTRIAN PATENT LAW.

We have to inform our readers that according to a decision of the Imperial and Royal Austrian Ministry of Commerce, taking effect from 1st March last, it is no longer necessary that foreigners applying for letters patent in Austria produce (1) the copy or original of their foreign letters patent, or (2) proof that their foreign patents are in force. (3) It is also no longer necessary to prove the working of the patent. Austrian patents will only be declared null and void when a suit is entered to have the patent annulled, and the patentee is unable to bring evidence to prove that his patent was worked in due time. We feel sure that inventors will welcome this decision of the Austrian Ministry as an immense improvement which shows that the Imperial Ministry wishes to encourage foreigners to protect their inventions in Austria.

Mr. Charles Bried, of Newark, N.J., has patented a mail bag fastening formed of four metallic strips of equal length, hinged together at the ends, having axes, with perforated arms on two of the strips and slots in the two opposite ones, having the axes adapted to be revolved so as to make the perforations in the arms coincide to receive the lock.

THOUGHTS ON THE DEATH OF A FRIEND.

In Memoriam.

Speak not of death, but of a life begun!
That heavenly seal which rested on the brow
Of her who wears a crown of glory now,
Was promise of a Life beyond the sun:
And, like th' imprisoned lark that longed to rise
(Though beauteous was the cage), the soul inspired
With hopes of endless joy and peace, desired
To mount with wings of faith above the skies.
Her lovely face was index to the gem
The casket held—a pure and peaceful mind.
Her bright example rests with those behind,
Who prayed for her: she prayeth now for them.
O, let us bless His holy name, and say—
"The Lord who gave, hath taken her away."

Redivivus.

Fair Nature's garden rested for awhile,
When winter's stormy winds were past and gone,
Until the sweet and long-expected smile
Of spring gave promise of a life to dawn.
The winter of our loved one, too, has passed,
Her years of patient waiting-time are o'er;
Her brightest hopes are realised at last;
She lives in glory now for evermore!
Two angels visited the earth one morn,
Each bearing from on high life-giving power;
And while a living soul to Heaven was borne,
Awakening Nature blossomed in that hour.
O grant it, Lord, this lesson may impart
That Thou the Life and Resurrection art.

Not lost, but loving, helping still.

Her faithful, loving heart has fled away!
Constrained by earthly cares it beats no more,
Ennobled by those cares which now are o'er;
Her spirit pure no longer here could stay.
Nor dare we mourn one ready to obey
The heavenly message, and prepared to pour
Her praises out upon the golden floor,
While we can only turn aside and pray.
Our best to Him we yield without a fear,
The wisdom, power, and love, tri-unity:
For though the home she loved is sad and drear,
'Tis hallowed by the holy memory
Of her who, though unseen, we feel is near,
Guiding us onward to Eternity.

A. B.

THE BENZOATE OF SODIUM IN CONSUMPTION AND DIPHTHERIA.

The inhalation of the benzoate of sodium in phthisis continues to attract attention in Germany. Prof. Rokitansky, of Innspruck, was the first to advocate it, and Dr. Winternitz and others who had visited his clinic report upon it very favourably. They aver that nearly all cases improve upon it, at least at first. This result is categorically denied by many other observers.

Its success as an agent in diphtheria is attested by Dr. Letzerich, of Berlin. The pseudo-membrane is dusted with powdered benzoate, applied through a glass tube or quill, two or three times a day. Older children may use a gargle of one part to twenty. The temperature and pulse together decline under this treatment. The pseudo-membrane contracts and becomes thinner and more transparent.

An improvement in snap hooks has been patented by Mr. John B. Hampton, of Pomeroy, Ohio. This invention relates to an improvement in fastening buckles, loops, and hooks to harness, bridles, &c., and the object thereof is to enable the connection to be made without stitching or riveting.

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THE INVENTOR'S INSTITUTE,

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Past Presidents:

SIR DAVID BREWSTER, K.H., LL.D., F.R.S., &c., from the establishment of the INVENTORS' INSTITUTE, till his decease, February, 1868. LORD RICHARD GROSVENOR, M.P.

President, SIR ANTONIO BRADY.

THE SESSION 1879—1880

Members' Meetings will be held at 8.15 p.m. on Thursdays, April 8th and 22nd; May 6th; and June 3rd.

On 8th April, Exposition of Inventions, and Patent Law Question.

On 22nd April, Mr. T. Morgan will read a paper on some recent inventions of considerable importance.

Executive Council Meetings at 7.30, on same evenings as above.

Annual General Meeting, Thursday, May 20th, at 4 p.m., unless otherwise arranged.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

Proceedings of the Institute.

MEMBERS' MEETINGS.

On the 26th February Mr. J. Cadett read his paper on "Brilliancy of Lighting," with special reference to the use and misuse of the limelight. A report is given in another column. Admiral Selwyn, Vice-President, occupied the chair. The paper was illustrated by dissolving views operated by an improved apparatus supplied by Mr. Stoward, the eminent optician, which proved highly entertaining to the ladies and gentlemen present, and showed that the improved was much superior to the unimproved apparatus. There was little discussion, but hearty votes of thanks were passed to Mr. CADETT, Mr. STEWARD, and the Chairman.

On the 11th March a Patent Law Conference was held, Mr. M. Zingler in the chair. Mr. A. J. Murray, Mr. Greenfield, and Mr. Morgan advocated the establishment of a sound International Patent Law.

On the 25th March Mr. Greenfield, who was to have brought some important matters before the Institute, was prevented from doing so by ill health.

EXECUTIVE COUNCILS.

On the 11th March, no business requiring to be reported to the members in general was transacted.

On the 25th March, the proceedings were confined to the transactions of ordinary financial business.

Monthly Notices.

Mr. T. E. Page, M.A., assistant-master at Charterhouse, and formerly Fellow of St. John's College, Cambridge, who has recently contributed a school edition of the first book of Horace's Odes to Messrs. Macmillan & Co.'s series of "Elementary Classics," intends publishing in the course of the next few years similar editions of the remaining books.

The death is announced of the Slavonic philologist Sresnewskii at the age of seventy-eight.

Dr. William Proctor, M.D., of Petergate, York, died on the morning of Sunday, the 7th inst. He was the Honorary Secretary of the Yorkshire branch of the British Medical Association, and Vice-President of the Yorkshire Philosophical Society. Dr. Proctor published in 1872 a work on 'The Hygiene of Air and Water.' He was the author of another useful book, 'The Practical Chemistry of the Non-Metallic Elements.'

The Yorkshire College of Science, Leeds, is considering the question of eseablishing a chair of agriculture. Dr. Heaton has addressed a letter to the agricultural association of the county, endeavouring to elicit information by which the Council may be guided. One section of the new buildings for the college is rapidly approaching completion.

The American Academy of Arts and Sciences will celebrate its one hundredth anniversary on the 26th May next.

Experiments on the growth of plants under intensified light are described by M. Pringsheim in the *Chemisches Central-blatt*, which he finds, under all colours, destroys the green colouring matter, but the blue rays effect the change in chlorophyll more rapidly than the red rays. The change, indeed, appears to be independent of heat, but it does not take place in the absence of oxygen.

Lord Selborne and Mr. F. G. Bramwell, chairmen respectively of the Council and executive Committee of the City and Guilds of London Institute, have addressed a letter to the Prince of Wales, as President of the Commissioners for the 1851 Exhibition, proposing to build a college for advanced technical education at a cost of £50,000 and upwards, at South Kensington, and to maintain the same at an annual charge of £5000 per annum above the amount of fees received. It is stated that the Executive Committee of the 1851 Commissioners recommend the acceptance of these proposals.

Restoring green colours to leaves.—According to Prof. Church, withered leaves of the usual autumnal colours—yellow, red, or brown—can be rendered green again by steeping in water along with a little zinc-powder.

The chloride of methyl is now used in extracting the odoriferous principles of plants. It enables the manufacturer to dispense with the tedious process of *enfleurage*.

The flowering period of trees, according to Dr. Staub's observations in the *Botanische Zeitung*, is hastened only when the mean temperature for the month is at least 3·5° F. higher than the average: a smaller increase does not affect vegetation. On the other hand, the smallest fall in the temperature of the month occasions a retardation.

In-breeding is not injurious, according to some observations on the cattle of Brittany made by M. Bellamy, who has thus been led to question the common doctrine.

Messrs. Griffith & Farran have in press a little volume of dialogues, by the use of which, as a class reading-book, it is believed that children will unconsciously and pleasantly gain some knowledge of the earth's surface and movement. "Glimpses of the Globe," as the volume is named, is by the author of some hints on school management, entitled "The Teacher," which were published last year by Messrs. Macmillan & Co.

M. le Bon, in a memoir recently crowned by the French Academy of Sciences, shows that the differences in the cranial development of individuals of one and the same race become greater the higher the race rises in the scale of civilisation. Hence, far from tending towards equality, men tend, on the contrary, towards increasing differentiation.

The Scientific Review

AND

SCIENTIFIC AND LITERARY REVIEW,

INCORPORATING THE "JOURNAL OF THE INVENTORS' INSTITUTE."

APRIL, 1880.

PATENTS AND POLITICS.

In the Parliamentary elections which have just taken place, and those in progress, we fear there is little utilization of them for the true interest of the country, scarcely any notice being taken of such great questions as the promotion of our industrial progress of which the Patent Law is the most practical branch; technical education and agricultural advancement,—everything being swamped by the reiteration of Whig and Tory Shibboleths with no reference to anything but the ascendancy of one party or the other. Now this is certainly a very lamentable state of things, for if these questions—and especially the Patent Law—be not fundamental, two and two do not make four. Foreign policy, Imperial consolidation, and other large questions, are by no means superior to them, the assertions of party politicians notwithstanding.

The Scientific Review is, of course, neither Whig nor Tory, Conservative nor Liberal, but when it finds the government of the one party or the other is inimical or indifferent to the development of practical science or the progress of industry, then it ought to do its best to publish such an important fact. The present Government, which is known as a Conservative one, in 1876 undertook to promote legislation on the patent laws, and the question was referred to as an important one in the Queen's speech delivered at the opening of Parliament that year, but in consequence of the opposition that was made to some of the proposed enactments of the Bill (which was brought in during that session), which were in effect subversive of the principles of Patent Law as a security for patent property, the Bill was dropped. However, before the final disposal of this Bill occurred, the Lord Chancellor had inserted very considerable amendments, and in the next Session of Parliament this Bill, in its improved form, was again brought before Parliament, but being still very objectionable, so much opposition was made to it, that it was withdrawn. In the year 1878 the matter was again referred to in her Majesty's speech, and, in consequence, a Bill very similar to the Lord Chancellor's was brought into the House of Commons by Sir John Holker, the Attorney-General, but as this Bill contained most of the objectionable clauses of the former Bill, though a great improvement thereon, it was opposed, and the Government thought fit to let it drop.

When it is called to mind that during all this time the Government had a very considerable reliable majority in the House of Commons, one cannot help thinking that the Patent Law was used very much like a plaything with which to pass the time away, instead of being treated, as what it really is, a vital question for the prosperity of the country.

Now, although we deem the Government decidedly blameworthy in this matter, we do not mean to say that the former Government took such action in the Patent Laws as real statesmen should do; for we know full well that, whether on the one side of the House or the other, there are pseudo-statesmen who oppose any kind of Patent Law as being a monopoly system; yet what we do point at is the fact that Lord Beaconsfield's Government, although publicly acknowledging the importance of the Patent Laws, and the necessity for their improvement, nevertheless abstained from amending them. On one important point it seems very unlikely that the present Government (if retained in power by electoral action) will do anything to benefit inventors, and that is—reduction of the cost of Patents; for it is clear that this cannot be reasonably expected from a Chancellor of the Exchequer who can select to make up his deficit such an objectionable impost as the Probate Duty, which is, in fact, a heavy tax upon a fulfilment of a requirement of the law, exacted in such a way that people have often to borrow money to pay it; thus not very unlike the Patent Stamp duties, a tax upon benefits that may accrue, and not upon benefits received.

Another ground for not trusting that any really favourable action in the Patent Law will be taken by the Beaconsfield Government, is that very recently the *Times*, which has unmistakeably shown itself to be the *fidus achates* of that Government, has, after having some time ago written in favour of the Patent Laws—again taken to vilifying them—according to its usual style, propping up untenable propositions by what may be very mildly termed sophisms, the latest utterance being with regard to the recent decision of the Court of Appeal in Von Heyden *v.* Neustadt (with reference to the salicylic acid patent infringed by making the acid abroad and vending it in this country), as to which the *Times* makes the assertion that "Patents are never very popular except among patentees," which has so little truth in it that we can only characterise it in the same terms as our contemporary *Engineering* has done, who remarks: "It would be interesting to know whence this erroneous impression—for erroneous it most certainly is—was obtained. We have from time to time ascertained the views of very many having no direct interest whatever in inventions or patents, and we cannot call to mind a single instance where opinion has been the reverse of favourable to the protection of inventions: not only as a matter of justice to the inventor, but also on the broader ground of public expediency—and all the evidence from time to time collected goes to support this view, and to show that those who object to patents are usually manufacturers who would be gainers by being able to use, free of royalty, some patented invention belonging to another. We will not go into the details of the particular case cited by the *Times*, though we may say the decision appears to have been sound and equitable. Even that journal does not, in a direct way, quarrel with the principle the Court of Appeal has enunciated. But it seems to us exaggeration to say that the principle enunciated might produce results, if a grasping greedy patentee were to enforce his rights, 'which would be fatal to the whole body of the Patent Law.' We also take exception to the assertion that the law does not make more friends the longer it lasts. A comparison of the public opinion of to-day with that of a few years back will show how clearly mistaken is the view adopted by the *Times* on this point." It cannot, however, be denied that our Patent Laws are open to improvement in many respects—and therefore the likelihood of their being dealt with by Parliament may perhaps be matter for congratulation—one cannot, however, look forward to the prospect without some misgivings, in view of certain observations the Attorney-General is reported to have made in the House of Commons recently, when Mr. Anderson, member for Glasgow, moved the second reading of his Patents for Inventions Bill.

We would add to these remarks that if the Liberal party comes into power, let us hope that Lord Granville will not be Premier and Lord Selborne Lord Chancellor, as they are declared enemies of Patent Law

Proceedings of Societies.

ROYAL SOCIETY.

Feb. 5th.—The President in the chair. The following papers were read:—"On the Spectrum of Carbon," by Profs. G. D Liveing and Dewar; and "On the Epipubis in the Dog and Fox," by Mr. T. H. Huxley.

Feb. 12th.—The President in the chair. The following papers were read:—"Studies on the Chinoline Series" and "Note on Electrolytic Experiments," by Prof. Dewar.

Feb. 19th.—The President, followed by Dr. Tyndall, V.P., in the chair. The Right Hon. the Earl of Northbrook was admitted into the society. The following paper was read:—"On Some of the Effects Produced by an Induction Coil with a De Meritens Magneto-Electric Machine," by Mr. W. Spottiswoode.

GEOGRAPHICAL SOCIETY.

Feb. 9th.—Right Hon the Earl of Northbrook, President, in the chair. Colonel C. G. Gordon was elected an honorary corresponding member. The following gentlemen were elected Fellows:—Messrs. E. Barber, H. S. Caldecott, J. C. Dimsdale, J. Gavin, J. H. Goodhart, N. A. Jephson, G. Matthews, A B. Moorhead, E. Rooker, P. L. Sclater, and A. J. Smith. The paper read was "Afghanistan: the Eastern Border of Pishin and the Basin of the Loras," by Major-General Sir M. A. S. Biddulph.

Feb. 23rd.—The Right Hon. the Earl of Northbrook, President, in the chair. The following gentlemen were elected Fellows:—Messrs. W. R. Arbuthnot, G. Batley, E. Haggard, F. Hill, H. C. Huggins, J. Jackson, R. Lesslie, D. M'Carthy, L. K. Rankin, H. C. Stephens, K. Takemura, I. Tokoogawa, and O. Toogood. The papers read were "Mr. Hore's Recent Visit to the Lukuga Outlet of Lake Tanganyika" and "The Marutse Mabunda Empire in South Central Africa," by Dr. E. Holub.

GEOLOGICAL SOCIETY.

Feb. 4th.—H. C. Sorby, Esq., President, in the chair. Messrs. F. Bond, C. H. Cobbold, F. Crisp, W. H. Dover, Mirza Mehdy Khan, J. Notman, and J. E. Williams were elected Fellows. The following communication was read:—"On the Oligocene Strata of the Hampshire Basin," by Prof. J. W. Judd.

SOCIETY OF ANTIQUARIES.

Feb. 5th.—E. Freshfield, Esq., V.P., in the chair. The Dean and Chapter of Canterbury exhibited, through Canon Robertson, a deed drawn up in the year 1072, in the presence of William the Conqueror, his queen, and a council of bishops (whose signatures are affixed), settling the question of the primacy of Canterbury and York. It appeared from some remarks communicated by Mr. E. M. Thompson that another copy of this deed is at Canterbury, bearing many more signatures of witnesses, and having the great seal attached. It also states at the end that the question was first discussed at Winchester, and afterwards at Windsor, and Mr. Thompson gave it as his opinion that the document exhibited this evening was the preliminary deed drawn up at Winchester. The names of the king and queen had been added by a scribe to their crosses, but the other signatures and crosses were probably in the handwriting of those whose names they bore. They consisted of Hubert, the Papal Legate (whose Italian hand, as Mr. Thompson observed, was in marked contrast to that of the other witnesses); of Lanfranc, the Archbishop of Canterbury; of Walchelin, Bishop of Winchester; of Wulstan, Bishop of Worcester; of Thomas, Archbishop of York; of Remigius, Bishop of Dorchester; and of Herfast, Bishop of Thetford. The body of the document will be found printed in Malmesbury's "Gesta Pontificum Anglorum," pp. 42-43, as extracted by him from the "Epistolæ Archiepiscopi Lanfranci" (see Mr. N. E. S. A. Hamilton's note to the "Rolls Series" edition of Malmesbury, p. 39). The document itself will be published in fac-simile in a forthcoming issue of the Palæographical Society. Mr. H. S. Milman called attention to the use of the word "Parochia" to denote the Province of York, the early use of the word being anterior to the existence of parishes in the modern sense. The Rev. J. A. Bennett communicated an account of an interesting series of papers relating to the Crown jewels and plate in the time of Charles I., which he had selected from a much greater number of Jewel House Accounts in the possession of Captain St. J. H. Mildmay, of Hazelgrove House, Somerset A full catalogue of them will be found in the Seventh Report of the Historical MSS Commission. Mr. D Bell supplemented the statements made by Mr. Bennett from the Mildmay papers by some notes which he had extracted from Jewel House Accounts in the Royal Library at Windsor Castle.

Feb. 12th.—E. Freshfield, Esq., V.P., in the chair. Mr. R. W. Binns exhibited and presented a photograph of the achievement of arms belonging to the Hadley Bowling Green Club, in the parish of Ombersley, Worcestershire, of which the original had been exhibited and described at a previous meeting Mr H. Laver communicated a paper on some curious mounds, known as the Salting Mounds, which are found at the edge of ordinary high water, and following the course of the various creeks on the coast of Essex, Kent, Suffolk, and Norfolk, which are evidently, as Mr. Laver believed, of great antiquity, but of which there is no account known nor even any tradition. They vary in height from two feet to five or six feet, and in some cases cover as much as thirty acres, more or less. They are composed of burned earth, and all of them contain fragments of coarse pottery Mr. C. T. Martin communicated extracts from a catalogue of plate and jewels delivered to Thomas Cromwell on his appointment in 1532 as Master of the Jewel House, descriptive of the same objects as those which nearly a century later (162) figured in the Jewel House Papers laid before the society at the last meeting by the Rev. J. A. Bennett. Mr. Martin then proceeded to read the second part of his paper on the Accounts Roll of Sir John Daunce, *temp.* Henry VIII.

Feb. 19th.—E. Freshfield, Esq. V.P., in the chair Major C. Cooper communicated an account of the discovery of 177 Roman coins (third brass of Tetricus the younger), 2 ft. 6 in. below the surface, in a round heavy lump, on Priestley Moor, in the parish of Flitwick, Bedfordshire. They were found in digging a drain, and the excavation beneath the surface of which they were lying was itself 8 ft. deep. This part of the land was most probably a huge swamp sixteen centuries back, and Major Cooper conjectured they may have been lost by and along with some person who failed to make his way across, and perished in the attempt. Mr. G. Payne, jun., communicated an account of yet further discoveries in his neighbourhood, comprising six Anglo-Saxon skeletons at the west end of the town of Sittingbourne. Nearly all the articles perished in the fall of huge masses of earth, split off by the workmen during excavations for brickwork. With one of the skeletons, however, was found near the skull a small black urn and an iron D-shaped object, probably a padlock. Also a Roman interment near Chalkwell, containing a leaden *ossuarium* in the form of a bowl, ten inches in diameter, containing bones, iron nails, a bronze bowl and jug, a vase of Durobrivian ware, and pieces of a glass vessel; all these were smashed to atoms by the workmen. Also three Roman graves at Bayford and two at East Hall, both near Sittingbourne. Mr. H. C. Coote communicated some notes on the Anglo-Saxon charter exhibited and described by Mr. W. de Gray Birch on January 17th. Mr. Coote's object was to define more closely the territory of the Magesætæ, which he believed to be coextensive with the county of Hereford—neither more nor less—and to determine within that territory and county the precise situation of the land given by Eadgar to his thane. This he showed to be Stainton-on-Arrow. Mr. F. R Conder communicated a paper on the date of the Egyptian calendar, and especially of the commemorations therein of the rising of the Dogstar. Mr. R. C. Nichols remarked that it might be open to doubt whether it was the heliacal rising of the star which was commemorated by the feast of Sothis, or whether this may not have been originally held at the period when the star was in opposition.

ARCHÆOLOGICAL INSTITUTE.

Feb. 5th.—The Rev. J. F. Russell in the chair. The Rev. H. M. Scarth sent a paper "On an Inscribed Votive Tablet found at Binchester (the ancient Vinovium)." The tablet was erected to Æsculapius and Salus, and is dedicated by a certain physician, and the chief interest of the inscription consists in its being a further testimony to the fact that the Roman troops in Britain were supplied with medical officers, and it likewise tends to the presumption that the *ala* of the Vetonnes, or body of Spanish cavalry from the province of Salamanca, were stationed at Vinovium. The inscription is as follows:—

[AES]CVLAPIO .
[ET .] SALVTI .
[PRO . SALV]TE . ALAE . VET .
[TONVM .] C R . M . AVRE .
[L . CRVSS]OCOMAS . ME .
[V . S .] L . M .

Mr. Scarth gave several other instances of Roman monuments erected either by or in commemoration of medical officers connected with the army in this country. As examples of the different ranks held by Roman military physicians, he instanced the titles "medici alarum," "medici cohortum," "medici legionum," and "medicus duplicarius triremis." The duties of the Prefectus Castrorum extended, according to Vegetius, over the sick soldiers and those physicians who had the care of them. Several inscriptions to soldiers of the Vettonian *ala* were also described. Mr. C. E. Keyser read a paper "On the recently discovered Mural Paintings at Patcham, near Brighton," in the course of which a new theory was adduced in explanation of the so-called "low side windows." Among the remarkable features of the interesting paintings in question were the thirty coats of whitewash with which they had been covered, and from beneath which they had been apparently satisfactorily disinterred. Mr. J. G. Waller spoke at some length on the definite laws which regulated paintings in churches, which laws were established as early as in the fifth century, and developed up to the time of the Reformation. With regard to the subject of "The Last Judgment," as represented at Patcham, the same general features occur in all such representations, but it was extremely difficult to say when the laws for this special subject were laid down. Mr. J. Neale and Mr. J. T. Micklethwaite spoke as to the means that had been employed to preserve the Patcham paintings. Among the antiquities exhibited was an embroidered pulpit cloth, formed of the orphreys and other portions of two copes from Woolchurch, Dorset, sent by Mr. E. A. Griffiths. Mr. Hartshorne exhibited a photograph of a sepulchral slab of a lady, lately found in Bangor Cathedral. The costume is of the middle of the fourteenth century, and the figure holds a *par precum*, or string of beads arranged in sets of seven, and having five circular brooches in immediate connection with them. Two pockets are shown in the front of the lady's long gown, which is

fastened with innumerable buttons down to the feet. Mr. H. S. Harland sent a rubbing of the tympanum of the south door of Everton Church, Notts, a sculpture of the same character as that at Moccas, Herefordshire. The Rev. G. T. Harvey exhibited a leaden disc found at Oundle. Many other antiquities were exhibited

BRITISH ARCHÆOLOGICAL ASSOCIATION.

Feb. 4th.—Mr. T. Morgan in the chair. Mr. R. Blair announced the discovery of 6,000 Roman coins near the station Hummum, on the line of the Great Roman wall between Newcastle and Carlisle. They are all of the later emperors and in capital preservation. Mr Grover exhibited some remarkable prehistoric weapons found in England and Switzerland, and Mr Cecil Brent some examples of so-called Rhodian glass of the fifteenth century, found in excavations in London. Mr. R. Smith described a gold ring found at Brancaster, and now in the collection of Mr Fitch, of Norwich. It has two faces confronting one another, with the inscription "Vivas in Deo." Christian inscriptions of Roman date being so rare in England, much attention was given to this object, but it is most probably the work of the Gnostics rather than Christians, as was pointed out by Mr. Grover. Mr. Teniswood exhibited some remarkable designs from the little known corona of the cathedral of Aix-la-Chapelle, of twelfth century date, and of much interest from their elaborate workmanship and details of costume. Major Bates, in referring to Mr Cope's recent paper on "Ancient Jade," stated that the natives of New Zealand held this material in high estimation not because of any religious belief, but because articles made of it were heirlooms among the principal chiefs. The first paper was by Mr. G. R. Wright, and was a description of the ancient frescoes recently discovered above the Norman chancel arch of Patcham Church. Mr. L. Brock considered the work late twelfth century work. The subject was the Day of Judgment, so usual in the position where found—over the chancel arches of our ancient churches. Mr. Patrick believed that this and similar works were tempera paintings rather than frescoes. See the report of the Archæological Institute. The second paper was on "Dogmore Pool, Cornwall," by Mr J Brent, and in the absence of the author it was read by Mr Brock. The Arthurian legends were examined and commented on. The meagre size of the lake and its flat surroundings hardly justify Mr. Tennyson's description.

Feb. 18th —Mr. H. S. Cuming in the chair. It was announced that the fratry of Carlisle Cathedral was under restoration, and that it was proposed to obliterate the ancient appearance of the building by refacing it with new stone, and also to remove all works of later date than that of the main fabric. A resolution deprecating both these undesirable principles was carried. Mr. S. Stevens described some Roman relics found on the banks of the Loddon, in a district not remarkable for objects of this period. Mr. T. Wright exhibited a rubbing from an unused slab in Sedgebrook Church, Lincoln, the date of which Mr. de Gray Birch deciphered: it is 1394. Mr. Wright also described a curious MS., "The Voyage of Italy," which has been the property of the Grover family for many generations. It is of early seventeenth century date, and has many quaint descriptions of places and pieces of advice, among which "Avoid the three W's—Wine, Women, and Words," is not the least curious. Mr. Pinches read an elaborate paper "On the Terra-Cotta Tablets of Babylonia and Assyria," and illustrated his remarks by several specimens of the various classes which he deciphered to the meeting. After indicating that stone and bark of trees formed the first writing materials of most nations, he referred to the very early use of clay, at first baked and afterwards unbaked. Some instances of the use of silver records, which 800 years afterwards were transferred to clay, were named, and others in stone, which had been recovered with much later inscriptions. The earliest clay tablets are those known as "compacts," while others have clay cases with the inscriptions repeated on the outside Some were in forms of cones, and placed in cavities of foundations of buildings At a later period in Assyria the tablets were large, and kept like books on shelves. The "correspondent" tablets are of great interest. The 'contract" tablets were filled with figures, and cannot be readily deciphered. The chairman read a paper on a portrait of Henry VI, painted on one of the panels of the rood screen of Eye Church. The figure has a nimbus, and is but little known. Mr. Brock called attention to the neglected condition of many similar figures in the Norfolk and Suffolk churches, many of which are of great antiquarian interest. A large number of copies of other figures by Mr. Watling were on the walls

LINNEAN SOCIETY.

Feb. 5th.—W. Carruthers, Esq., V.P., in the chair. Mr. C. Stewart showed a specimen of the intranuclear network of the vegetable cell from the ovary of *Hyacinthus Orientalis* under the microscope, and by diagrams elucidated its nature. Dr. F. Day exhibited samples of Salmonidæ, some of which had been reared under natural and others under unnatural conditions. A *Salmo fontinalis*, which had passed its existence in the Westminster Aquarium, had the head preternaturally elongated and a very narrow suboperculum; thus in striking contrast to examples reared from the same batch of imported eggs, and kept in a wild state in Cardiganshire Mr R I Lynch brought under notice pods of *Acacia homalophylla*, wherein each seed was attached by a very long and bright red funicle, which doubly folded on the sides of the seed. The funicle is supposed to be always detached with the seed, and from its brilliant colour to serve as an attraction to birds, and so assist in the dissemination of the plant. Mr. A Hammond exhibited a larva of *Tanypus maculatus*. He mentioned that the coronet and appendages of the thoracic and anal regions had been said to be homologous with the respiratory organs of the larva and pupa of gnats, &c. This he doubted, inasmuch as the former originated from the ventral and not dorsal surface, as did the latter, and no tracheæ of any size could be traced in them. The two oval bodies in the thorax, De Geer's so-called "air reservoirs," he (Mr. Hammond) considers to be salivary glands, similar to those of the larva of the crane fly, previously described by him. Mr. C. B. Clarke then gave an oral *résumé* of the order Commelynaceæ, which order he had lately worked out for De Candolle's "Prodromus." He defined this order by the position of the embryo, as not surrounded by the albumen, but closely applied to the embryostega, which is always remote from the hilum. An important auxiliary character is that the three segments of the calyx are always imbricated, so that one is entirely outside the two others. Mr. Clarke divides the Commelynaceæ into three tribes: (1) Pollieæ; (2) Commelyneæ; and (3) Tradescantieæ, whereof there are 26 genera and 309 species. A remarkable feature of several species (*Aneilema versicolor*, &c.) is the change of colour of the petals from a bright yellow when fresh to a deep blue when dry. Afterwards the Secretary read a paper "On the Salmonidæ and other Fish introduced into New Zealand Waters," by Mr. H. M. Brewer. The author refers to ten fish, viz., Salmon, Californian Salmon, Trout, American Charr, Perch, Tench, Carp, Cat Fish, White Fish, and the Upukororo.

ZOOLOGICAL SOCIETY.

Feb. 3.—Prof. Flower, President, in the chair. Captain W. V. Legge exhibited and made remarks upon some specimens of the little ringed plovers of India and Ceylon. Letters and communications were read from Dr. G. Hartlaub, containing the description of a new species of heron obtained in Mohambo in Northern Madagascar, which he proposed to name *Ardea Rutenbergi*; by Mr. O. Thomas on a specimen of *Myoxus elegans*, Temminck, obtained by Mr. H. Pryer near Yokohama, Japan; from Mr. H. N. Moseley, containing the description of a new species of simple coral, which he proposed to call *Desmophyllum lamprostichus*, by Prof. F. J. Bell on Palæolampus, a new species of irregular Echinoidea, which presented among others the following archaic points: (1) the rows of pores were completely parallel and extended regularly to the ambitus, (2) some of the pores exhibited an elongation indicating the appearance of the connecting groove, (3) the outer row of each pore-series was continued uninterruptedly to the actinistome, and (4) two of the ocular pores retained indications of their primitively double character; by Messrs. C. J. Danford and E. R. Alston "On the Mammals of Asia Minor," Part II., in which they added certain species to their former list, and described a new species of Vole under the name of *Arvicola Guentheri*; and by Mr. Sclater on a fifth collection of birds from Duke of York Island and its vicinity. Four species were described as new, and proposed to be called *Megalurus interscapularis*, *Pœcilodryas Æthiops*, *Munia melæna*, and *Rallus insignis*.

PHOTOGRAPHIC SOCIETY.

Feb. 10th.—J. Glaisher, Esq., President, in the chair Dr. Huggins read a paper "On the Photographic Spectra of Stars," describing the apparatus he had devised and the photographs taken upon gelatine emulsion dry plates, the results suggesting that these spectra indicated different ages of the stars. Captain Abney read a paper "On a Process for Printing by Development," using washed sensitivised paper, either plain, albuminised, or gelatinised, and a ferrous oxalate developer.

CHEMICAL SOCIETY.

Feb. 5th.—Mr. Warren de la Rue, President, in the chair. It was announced that a ballot for the election of Fellows would be held at the next meeting (Feb. 19th). The following papers were read:—"Note on the Assumed Formation of Ozone by the Atmospheric Oxidation of Phosphorus," by Mr. C. T. Kingzett; "Contributions from the Laboratory of Tokio, Japan: II. On Persulphocyanite of Silver," by Mr. R. W. Atkinson; "On Methylated Dioxethyleramines," by Mr. H. F. Morley; "Note on Igasurin," by Mr. W. A. Shenstone; and "On some Reactions of Tertiary Isobutylic Iodide," by Mr. L. Dobbin.

Feb. 19th.—Mr. Warren De La Rue, President, in the chair. The list of officers and council proposed by the Council for the ensuing year was read from the chair. The principal changes are:—President, H. E. Roscoe; Vice-Presidents, Warren De La Rue, J. Dewar, V Harcourt, in the place of F. Field and H. E. Roscoe; other Members of the Council, C. Graham, H. M'Leod, E. J Mills, J. M. Thomson, instead of A. H. Church, W. H. Hartley, and E. Riley, who retire. The President mentioned that a crystal had been prepared by Mr. Hannay; its angles, lustre, hardness, &c., were identical with those of the diamond; a similar crystal when burned was found to contain 97 per cent. of carbon; it was, therefore, to all intents and purposes, a diamond. The following paper was read:—"On the Production of Ozone during the Combustion of Coal Gas," by Mr. R. H. Ridout. Prof. M'Leod made some remarks in reply to a criticism of Mr. Kingzett as to the formation of ozone during the slow oxidation of phosphorus. In his opinion, while fully admitting the justice of Mr. Kingzett's criticism, the evidence was quite conclusive without the quantitative results. Mr. R. H. Ridout gave a short account of some new and improved laboratory appliances. Dr. Armstrong made some remarks on some recent researches on the so-called unsaturated compounds.

ASTRONOMICAL SOCIETY.

Feb. 13th.—Lord Lindsay, M.P., President, in the chair.—Capt. J. Steele and Mr. W. H. Bartlett were elected Fellows. The President mentioned that Volume XLI. of the *Memoirs*, upon 'Observations made during Total Solar Eclipses,' was now ready for distribution. The volume had occupied Mr. Ranyard nearly nine years in its preparation, and contains a discussion of observations made up to the total eclipse of April, 1875.—Portions of the Annual Report were read to the meeting. Thirty-one new Fellows and four Associates had been elected during the past year Dr. Lamont, of Munich, was the only associate who had died, but amongst the Fellows the number of deaths was much greater than usual. Lives are given in the Annual Report of Mr. R. Farley, Sir R. Hill, the Rev. H. C. Key, Mr. S. C. Whitbread, Mr. J E. Richard, Mr. I Fletcher, Prof. Clifford, Mr. Drach, and Sir T. Maclear.—Eighteen minor planets had been discovered during the past year, mostly by Messrs. Peters and Palisa. Six comets have been observed during the past year, two of them known periodical comets, viz., Brorsen's comet and Tempel's periodical comet of 1867; the others are believed to be new comets.—The meeting then proceeded to the ballot for the election of Officers and Council for the ensuing year, and the following gentlemen were declared to be elected: President, J. R. Hind; Vice-Presidents, J. C. Adams, Sir G. B. Airy, A. Cayley, and E. Dunkin; Treasurer, F. Barrow; Secretaries, W H. M. Christie and J. W. L. Glaisher; Foreign Secretary, Lord Lindsay; Council, Sir E. Beckett, A A. Common, W. Huggins, E. B. Knobel, G. Knott, W Lassell, A. Marth, E. Neison, A. C. Ranyard, H. J. S. Smith, E. J. Stone, and Major J L. Tupman.

ASIATIC SOCIETY.

Feb. 16.—Sir H. C Rawlinson, President, in the chair.—Major-General H. C. Johnstone, Col. M. R. Haig, and Mr. T. R. Gill were elected Resident Members—Prof. F Max Müller read a paper 'On the Discovery of Sanskrit Texts in Japan.' It is a well-known fact—well known, at least, to all students of the history of Buddhism—that, beginning almost with the beginning of our era, there has been a constant flow of Sanskrit MSS. from India to China. The earliest translators of Buddhist texts in China were those who worked under the Emperor Ming-ti, viz., Kâsyapa Matanga and Tsu-fa-lan. Their most important works are the 'Sûtra of the Forty-two Sections,' and translations of the 'Dasabnumi-Sûtra' and the 'Lalita Vistara,' the legendary 'Life of Buddha.' Considering that these works would not have been translated unless they had acquired in India a kind of canonical authority, these translations themselves enable Buddhist scholars to assign to the Sanskrit originals, so far as they agree with the Chinese translations, at all events an ante-Christian date, a point of great importance in a comparative study of the ancient religions of the world In 150 A.D. another famous translator is mentioned, An-shi-kau, a native of Eastern Persia or Parthia, the son of a king, who, like Buddha, made himself a mendicant and travelled to China. Mr. Wylie supposes An-sik to represent Arsak, and takes him for a son of one of the Arsacide kings of Persia. In about 170 A.D. Chi-tsin is mentioned as the translator of the 'Nirvâna-Sûtra,' and in 250 Chi-meng translated the 'Rules of the Priesthood' from a MS. said to have come from the city of Pâtali-putra, or Patna. In 260 A.D. Dharmaraksha made a large collection of Buddhist and Brahmanic MSS., and with the help of other Shamans he is said to have translated no less than 165 texts. This brings us to the time of the Emperor Yao-hing (397-415), who secured the services of the learned translator Kumâragiva, and sent Fa-Hian to India to India to collect MSS. In 460 A.D. we read of five Buddhists arriving in China from Ceylon by way of Tibet. These, no doubt, brought Pâli MSS. with them. Bodhidharma, too, the twenty-eighth Buddhist patriarch, came from the South in 526 A.D., though not from Ceylon. In 518 the famous traveller Sun-Yun was sent by the Queen of Wai country in search of Buddhist books, and we gather from his 'Travels,' translated by Mr. Beal, that after three years spent in India he returned to China with 175 volumes. During the Siu dynasty, 589-619, the number of Buddhist books translated into Chinese is said to have risen to 1,950. That number was considerably increased afterwards, particularly by Buddhist pilgrim Hiouan-Thsang, who is said to have translated 740 works, forming 1,335 books. With these facts before us the question naturally arises, What has become of all these MSS.? We have the Chinese translations, then why should their originals not have been preserved, or, if not the original MSS., at least copies of them? The late Prof. H. H. Wilson was so much struck with the importance of discovering the traces of that lost tribe of Sanskrit MSS., that he used all his influence to set on foot an inquiry, in which he had the energetic assistance of Sir John Bowring, the English Minister in China. Letters of inquiry were sent to the authorities of monasteries and temples, catalogues of libraries were examined, but all ended in disappointment. No Sanskrit MSS. were found. The whole correspondence that passed between Prof. H. H. Wilson, Sir John Bowring, and Dr Edkins was printed at the time in the *Journal* of the Royal Asiatic Society, and then the matter dropped. Prof Max Muller has for years impressed any of his friends who went to China with the necessity of further inquiries, and some years ago a book that Dr. Edkins sent him from Japan induced him to extend these inquiries to that country also. That book, which was published in Japan, contained a glossary of Chinese words, with their equivalents in Sanskrit, and transliterations of the Sanskrit words in Japanese. The Sanskrit words were represented in an alphabet closely resembling the old Nepalese alphabet, though disguised in a flowery style that made the Sanskrit letters look almost like Chinese. The existence of such a book proved that there must have been a time when it was useful to students in Japan, *i.e.*, that there must have been a time when the Buddhist priests in Japan were able to read Sanskrit. By a most fortunate combination of circumstances, at the very time that Prof. Max Muller was working at the Sinico-Sanskrit Glossary, received from Japan, a Buddhist priest, Mr. Bunyiu Nanjio, was sent to him in order to learn Sanskrit at Oxford, and to study the sacred writings of Buddhism in their original languages, Sanskrit and Pali. From the very first Prof. Max Müller tried, through his pupil, who after a time was joined by a second, Mr. Kasawara, to gain information about Sanskrit texts in Japan, and after waiting for some time, he received last December a Japanese Book, sent to him by a native scholar, Shuntai Ishikawa. It was a Sanskrit text, written in the same old Nepalese alphabet, each word transliterated with Japanese letters, and translated into Chinese. Shuntai Ishikawa requested Prof. Max Müller to read the Sanskrit text, correct it, and send it back to Japan. Here, then, was the unexpected reward of long-continued research, and there is every hope that where one Sanskrit text has been discovered, others may follow. Prof. Max Müller exhibited a corrected text of the Sanskrit original, and a literal translation with notes. He proved that the Sanskrit text, the Sukhavatî-vyûha, was an old text, and not an abbreviation made in China or Japan. There is another well-known Sûtra of the same name, of which several MSS. exist in England and France, and which has been translated into Chinese and Tibetan. This is one of those lengthy, tedious Sûtras which Burnouf has well characterized in his 'Introduction à l'Histoire du Buddhisme.' These lengthy Sûtras, however, presuppose the existence of simple Sûtras, and it is one of these simple Sûtras that has been recovered in Japan. It contains a description of the Paradise of Amitâbha Buddha, and belongs to the Mahâyâna school, which in Japan has well-nigh obliterated the original pure and simple teaching of Buddha Sâkya Muni. It differs, however, from other simple Sûtras by introducing Bodhisattvas as followers of Buddha, their presence being, according to Burnouf's hypothesis, a distinguishing feature of the large or Vaipulya Sûtras. That the Sanskrit text now discovered in Japan is an ancient text was proved by showing that it must have been the original from which a Chinese translation was made by Kumâragiva about 400 A.D., while another Chinese translation, either of the simple or the the lengthy text, is mentioned as early as the second century. The Chinese translation of the short Sanskrit text has been translated into English by Mr. Beal in his 'Catena,' and a comparison of that rendering with the original Sanskrit shows how cautiously we ought to use the Chinese translations of Sanskrit books. If more of these original Sanskrit texts could be recovered in Japan or in China—for there is no reason yet to give up all hope—a new start would be made in the study of Buddhism, more particularly in the study of what is called the Buddhism of the North. The Japanese Minister, his Excellency Mori Arinori, who was present at the meeting, promised to lend every assistance in his power to recover, if possible, some more of those ancient Sanskrit texts.—Mr. J. W. Redhouse read a paper 'On the Identification of the "False Dawn" of the Moslims with the "Zodiacal Light" of Europeans,' and quoted largely from the letters he had received from different astronomers all over the world fully confirming his views.

STATISTICAL SOCIETY.

Feb. 17th.—Sir R. W. Rawson in the chair.—The following new members were elected: Messrs. A. C. Tupp, P. H. Fowell-Watts, M. G. Mulhall, W. Parkin, T. E A. Gwynne, J. Smith, I. L. Bell, G. A. Oakeshott, W. A. Bowser, and Hon. F. Strutt.—A paper, by Mr. T. A. Welton, 'On Certain Changes in the English Rates of Mortality,' was read and discussed.

MICROSCOPICAL SOCIETY.

Feb. 11th—Anniversary Meeting.—Dr. Beale, President, in the chair.—Twelve gentlemen were elected or nominated for fellowship. The Reports of the Council and Treasurer showed that the condition of the Society was highly satisfactory, an exceptionally large number of new Fellows having been elected last year, and the revenue having increased by more than £200. The following are the Officers and Council for the ensuing year: President, Dr. L. S. Beale; Vice-Presidents, Dr. R. Braithwaite, Dr. W. B. Carpenter, Prof. P. M. Duncan, and H. J. Slack; Treasurer, J. W. Stephenson; Secretaries, C. Stewart and F. Crisp; Members of Council, Dr. W. J. Gray, Dr. J. Matthews, J. Badcock, W. A. Bevington, A. E. Durham, C. J. Fox, J. Glaisher, A. de

Souza Guimaraens, A. D. Michael, J. Millar, F. H. Ward, and T. C. White. The President delivered his annual address, in which, after referring to the gratifying position of the Society and the great improvement that had taken place in the *Journal*, he discussed the nature of the changes occurring in living matter. Facts and arguments were adduced against the doctrine generally entertained concerning the physical nature of vital phenomena, many of Dr Allman's statements in his British Association Address were called in question, and serious objections raised to the acceptance of *Bathybius Haeckeli*, in the existence of which Dr. Beale did not believe.

SOCIETY OF ARTS.

Feb. 12th.—Mr. H. Doulton in the chair. A paper 'On Gas Furnaces and Kilns for Burning Pottery' was read by Mr H. Guthrie before the Section of Applied Chemistry and Physics.

Feb. 16th.—The third lecture of his course 'On the Manufacture of India-Rubber and Gutta-Percha' was delivered by Mr. T. Bolas.

Feb. 17th.—Dr. B. W. Richardson in the chair. A paper 'On the Principal Causes of Diseases in Tropical Countries Scientifically Considered' was read before the Foreign and Colonial Section by Mr. A. W. Mitchinson.

Feb. 18th.—Field-Marshall Lord Strathnairn in the chair. Six candidates were proposed for election as Members. A paper 'On the Euphrates Valley Railway' was read by Mr. W. P. Andrew.

Feb. 23rd.—Mr T. Bolas delivered the fourth lecture of his course "On the Manufacture of India-Rubber and Gutta-Percha."

Feb. 24th.—Sir C. Nicholson, Bart., in the chair. A paper entitled "Views of Colonisation" was read before the Foreign and Colonial Section by Mr. W. Forster.

Feb 25th.—J. Stevenson, Esq., M.P., in the chair. Seven candidates were proposed for election as members. A paper "On the Noxious Gases Bill" was read by Mr. E. K. Muspratt.

MATHEMATICAL SOCIETY.

Feb. 12th.—Mr. C. W. Merrifield, President, in the chair. Mr. D Edwardes was elected a member, and subsequently admitted into the Society. The following communications were made: 'Geometrical Notes,' by Prof. H. J. Smith, 'On the reflections of Vibrations at the Confines of Two Media between which the Transition is gradual,' and 'On the Stability or Instability of Certain Fluid Motions,' by Lord Rayleigh, and 'The Calculus of Equivalent Statements' (fourth note), by Mr. H. M'Coll.

ANTHROPOLOGICAL INSTITUTE.

Feb. 10th.—F. Galton, Esq., F.P., in the chair.—The following new Members were announced: Messrs T. Hodgkin, A. Tucker, H C. Stevens, J. A. Farrer, B. M. Wright, T. W. W. Robinson, and W. D. Gooch. Dr. E. Holub delivered an address on the central South African tribes from the south coast to the Zambesi. Dr. Holub had found along the south coast traces of tribes which do not now exist, heaps of burned bones of wild animals, none of domestic animals, and broken shells. Other tribes once belonged to the regions between the Limpopo and Zambesi, and here were found ruins of towns, generally in the vicinity of mines, especially gold mines. The houses were of stone, on the top of mountains, put together without any cement, but so well fitted that they have stood for hundreds of years. Some of the ruins were formed of blocks of granite in the shape of bricks. The tops of small hills were fortified in this way with openings in the walls. The remains probably belonged to those who inhabited the ancient empire of Monopotapa, mentioned by the Dutch and Portuguese traders as existing two hundred years ago. When a country is conquered it is the custom to kill all the male population, take the women and children prisoners, and educate the latter as warriors of the victorious tribe. In this way whole tribes have ceased to exist in South Africa; even since Livingstone's time a powerful tribe of Basutos, on the Upper Zambesi, named the Makololas, has been almost exterminated. Dr. Holub divided the living tribes into three races, the Bushmen, the Hottentots, and the Bantus. He found a link between the Bushmen and the Bantu family, and between the Bushmen and the negroes, but not between the Hottentots and the Bantus. The Bushmen are rapidly dying out, and are utterly incapable of civilization. They use stone weapons and poisoned arrows, but the bows and arrows are of very simple construction compared with those in use among the nations of North and South America. The Hottentot race is divided into three tribes, the real Hottentots, the Griquas, and the Koranas No South African tribe has taken so eagerly to the vices of civilization as the Hottentot race. The Bechuanas observe many of the virtues of the white man, but the Hottentot adopts only his vices, drunkenness is the chief cause of their dying out. They do not seem to have any religion, but a kind of freemasonry exists among them. the outward and visible sign of which is three cuts on the chest, made with appropriate ceremony.

PHYSICAL SOCIETY.

Feb. 14th.—Annual General Meeting—Prof. W. G. Adams, President, in the chair. The President read the Report for the past year, which showed that the position and prospects of the Society were in every way satisfactory, and that more papers had been read during the past twelve months than in any previous year.—Sir W. Thomson was chosen President for the ensuing year, and various other officers were elected. The following new Members were elected:—Messrs. Mollison, Hare, J. C. Lenis, Miss Caroline Martineau, and Senor Roig y Torres, of Barcelona. The following papers were read: 'On a Quartz and Iceland Spar Spectroscope corrected for Chromatic Aberration by Dr. W. H. Stone; 'On an Automatic Switch for Telephone Circuits,' by Mr. W. Wynne, and on their 'New Theory of Terrestrial Magnetism,' by Profs. Ayrton and Perry.

INSTITUTION OF CIVIL ENGINEERS.

Feb. 10th.—Mr. W. H. Barlow, President, in the chair. The paper read was "On Iron and Steel at Low Temperatures," by Mr. J J. Webster.

Feb. 24th.—Mr. Brunlees, V.P., in the chair The paper read was "On the Use of Asphalte and Mineral Bitumen in Engineering Works," by Mr. W. H. Delano.

FOLK-LORE SOCIETY.

Feb. 10th.—Mr. H. C Coote in the chair. A paper was read by Mr J. Fenton "On Biographical Myths, illustrated from the Lives of Buddha and Mohammed." The myths surrounding the lives of great men have usually been passed over by historians as unworthy of attention. But if the law of the accretion of myths be observed, the myths become a valuable aid in reconstructing history. The period of expectation which precedes the coming of a great man produces an ideal personage, answering to popular aspirations, around whom all sorts of myths congregate. Hence a great man is viewed through a sort of mental lens, formed of the ideal he realises. But at the same time he modifies the ideal, because his actual life differs from it. Finally, therefore, he is viewed as himself idealised. The result of this upon the myths of the ideal is that those which cannot conform to the realisation fall away, and others are modified till they do so conform. Hence, knowing the original myth, we know the ideal; knowing its later form, we know the influence of the historic personage, and can estimate the influence of one upon the other. As a rule, myths are found to cluster round four periods of life: birth, early manhood, mature manhood, and death. In illustration it was shown how the stories of Buddha's birth, awakenment, perfect enlightenment, and death ran parallel to the birth, purification, ascent into heaven, and death of Mohammed, the motives being alike in each series, but the working out dependent upon the historic factors in each. The transformation which myths undergo was illustrated from the cleansing of Mohammed's heart and the birth of Yasada, which were shown to be popular stories moulded into accordance with historic fact. Mr. Gomme read some "Notes on Primitive Marriage Customs," pointing out that the story of Catskin probably contained a survival of the form of bride-capture, and giving some further notices of old wedding customs. Messrs. Micklethwaite, Nutt, Millman, Conway, Vaux, the Rev. J. Long, and the Rev. J. G. Fleay took part in the discussion on the papers.

NUMISMATIC SOCIETY.

Feb. 19th.—J. Evans, Esq., President, in the chair. The following gentlemen were elected members:—Messrs. N. Heywood, W. Theobald, H. E. Williams, and W. W. Wroth. Mr. Evans exhibited a three-farthing piece of Elizabeth, dated 1573, with the acorn mint-mark. The Rev. Canon Pownall exhibited an impression of a gold triens of the Merovingian period, with the legend DORKV (?) on the observe and a cross patée on the reverse. Mr. Henfrey sent for exhibition a drawing of an Anglo-Saxon sceatta found near Eastbourne, similar to Ruding, Plate I., 35 Mr. R. Hoblyn exhibited specimens of the copper coinage of Sarawak, consisting of the cent, half cent, and quarter cent, 1863, of Sir J. Brooke, Rajah, also of the same denominations of 1870 and 1879 of C. J. Brooke, Rajah. Mr. Hoblyn likewise showed proofs in silver of the gun-metal crown of James II. and of the white-metal crown with the inscribed edge of the same monarch. The Rev. Canon Greenwell read a paper on some rare and beautiful Greek coins in his own cabinet. Among them were a tetradrachm of the town of Eryx in Sicily, an octadrachm of Abdera, a magnificent tetradrachm of Amphipolis, and a remarkable Cyzicene stater bearing an undoubted portrait. The Rev. Canon Pownall read a paper "On Anglo-Saxon Coins struck at Stafford."

ENTOMOLOGICAL SOCIETY.

Feb. 4th.—J. W. Dunning, Esq., V.P, in the chair. Mr. P. F. Copland was elected a member, and Messrs. J. B. Bridgman and P. Cowell subscribers. Mr. Stainton exhibited, on behalf of Mr. Grigg, a specimen of *Heliothis scutosa*, captured near Weston-super-Mare Mr. Pascoe exhibited a specimen of the "fire-fly" of the Amazon Valley, *Aspisoma lineatum*. It has the usual intermittent light flashing at intervals of two seconds, but Mr. Pascoe believed it was capable of keeping back the light for an indefinite time. The Rev. H. S. Gorham objected to the term "fire-fly" being applied indiscriminately to all luminous insects, there being many luminous Coleoptera, and as regards the flashing of the light from these insects he considered it was often simply due to the creatures crawling over leaves and herbage, and thus exposing the ventral surface only at times. Mr. Meldola remarked that some years ago he had examined the spectrum of the glow-worm and found that it was continuous, being rich in green and blue rays, and comparatively poor in red and yellow. Mr. Pascoe also exhibited the two sexes of *Isopogon Hottentotus*, a dipterous insect which was reported as hitherto unrecorded in this country, and remarked upon the gregarious habits of this species compared with those of others of the family. The Secretary exhibited, on behalf of Mr. G. Francis, specimens of a South Australian moth (Anapæa, Sp.) which feeds on the native Eucalypti. Mr. Swinton forwarded a letter calling in question the specific distinctness of *Acronycta Psi* and *A. tridens*, considered as separate species by Mr. Butler in a recent communication. Mr. Meldola read a note "On the Protective Attitude of the Caterpillar of the Lobster Moth," extracted from *Kosmos*, November, 1879. The following papers were also communicated:—"Materials for a Revision of the Lampyridæ," Part II., by the Rev. H. S. Gorham; and "On some Coleoptera from the Hawaiian Islands," by Dr. Sharp.

SOCIETY OF PUBLIC ANALYSTS.

AT the annual meeting of this Society, held on the 15th January, at Burlington House, Piccadilly, the president, Dr. Muter, in the chair, the minutes of the previous meeting were read and confirmed.

The President delivered his annual address as follows:—Gentlemen, it is customary for the retiring president of our society to say a few words of farewell, coupling them with remarks upon the general position of the society and the working of the act of parliament under which we all hold office. I am glad to say that the past year, so unfortunate to many both at home and abroad, has been comparatively gentle to us, seeing that we have only lost two members by death, namely, Messrs. H. Goode and J Whitla, with neither of whom had I the pleasure of a personal acquaintance, but I have understood from those who had that they were men making their mark on the sands of time, now alas, too soon washed out by the tide of eternity. During the year one member has resigned, and two have been struck off by the council for non-payment of their fees, but to make up for this loss five new members have been elected, thus keeping "our balance true" up to the moment. So that we stand now with 90 members and 12 associates, being a total gain of two in the last twelve months. We are also more fully endowed with that very necessary article called "worldly dross" by those who have not got it, seeing that although our payments have increased by £18 on account of the *Analyst*, we have still a balance at our bankers which is £2 better than last year. Gentlemen, our society is not and never can be large, because it is limited to a certain class, and owing to the vast preponderance of country members our meetings may not be very numerous, but still we have a distinct *raison d'être*, and we carry that out to the letter. You will excuse me imitating Mr. Silas Wegg and "dropping into poetry" unconsciously, but after all it is something to boast of that we do act up to our aspirations, which is more than can be said of all other scientific associations. We do not pretend to elevate the morals of our members and then find ourselves helpless when cases arise requiring such elevation, neither do we pretend to raise the fees receivable for work done and then find that we have upon our council some most notorious offenders in that respect, nor do we get up discussions on subjects specially the province of other societies, and end them in smoke. What we do profess we carry out, namely, to improve the process of analysis in all matters relating to food. Germany is and has always been looked up to as the foster-mother of general chemical discoveries, but for research in our special subjects we must look at home; and everyone must admit that Great Britain is up to the present the source of special food research, and that all which has been done has been mainly attained by the members of the Society of Public Analysts. During the last year we have had either read here or published in our journal (the *Analyst*) no less than forty-one memoirs relating to our branch of the chemical profession, and that, remember, all carried out not by wealthy *dilletanti* or men receiving grants from research funds, but by persons daily and actively engaged in carrying out the complex and tedious duties thrown upon them by an act of parliament. Let us, gentlemen, strive to keep the position so nobly attained, and let us one and all resolve to do more and more every year in the grand cause of the advancement of our art, so that we may keep pace with our enemies, the adulterators, and let the public of Great Britain have that most precious of boons, namely, pure food and drugs. As regards the act and its working we must congratulate ourselves that, oiled by the good lubricator, time, our wheels move smoother every year. More and more our processes and modes of interpretation of results continually receive general acceptance, and closer do we and our Appeal Court at Somerset House draw to each other. I believe sincerely that Mr. Bell and his colleagues try most earnestly to elicit the truth, and were they only freed from the absurd restriction which prevents their coming amongst us and letting us know their standards and experimental results, there would hardly ever be the difference of a decimal point between our conclusions and theirs. We must, however, trust to time, and I can only hope the day is not far distant when the heads of the Somerset House Laboratory will be found enrolled among us, and helping as we do to disseminate the knowledge of food analysis, instead of being compelled to keep their results locked up through a piece of Government red tapeism. The amended act of last session has proved a great public good in the case of peripatetic vendors of food, who were before enabled to carry on, without fear, the most barefaced schemes of adulteration; and the recent decision of the High Court to the effect that if a man asks for an article and pays the full price for it he is distinctly entitled to receive that article in a state of purity, notwithstanding any declaration or notice to the contrary, is a distinct advance in equity in the interests of the public. Gentlemen, with these few words I will bid you *adieu*, hoping that we may all meet again at our next anniversary improved in knowledge and with the full consciousness that we have each given our stone to the grand cairn of the science of food analysis now being erected in our midst, so that our successors in the next generation may have reason to be thankful for the establishment of the Society of Public Analysts.

Mr. Allen proposed a vote of thanks to the president for his address, and hoped that it would be published not only in the *Analyst* but in other journals, as it showed what a large amount of real scientific work public analysts had done within a very short time.

Dr. Dupré, in seconding the vote, expressed a similar hope, and said that if their fellow chemists in England once became aware of the good work they were doing, the society would rise considerably in their estimation. He took the opportunity of saying that he thought there should be a little more *esprit de corps* among the members, which was one of the greatest reasons for establishing the society. He also said that as no analyst could pretend to know everything, it would be very wise if a member, when he had an article with which he was little acquainted, would write to the secretaries, who would always know the best member to give any required information.

The proposal having been unanimously agreed to. Dr. Muter returned thanks.

The President proposed that the thanks of the society be given to the council of the Chemical Society for the use of their rooms for meetings, which was unanimously agreed to.

The President proposed a vote of thanks to the members of council for their attention to the business of the society during the past year, which was also agreed to.

The President proposed a vote of thanks to the secretaries, Messrs. Heisch and Wigner, for their services during the past year, which was also agreed to.

Mr. Angell and Mr. West-Knights were appointed scrutineers to examine the voting papers for the election of officers and council, and they reported that the following were elected:—President: J. Muter, Ph.D., M.A., F.C.S. Vice-Presidents: A. Dupre, Ph.D., F.R.S., F.C.S.; J. W. Tripe, M.D.; A. Wynter Blyth, M.R.C.S., F.C.S. Treasurer: C. W Heaton, F.C.S. Hon. Secretaries: Charles Heisch, F.C.S.; G. W. Wigner, F.C.S. Other Members of Council: J. Carter Bell, F.C.S.; J. Campbell Brown, D Sc., F.C.S.; C A. Cameron, M.D., F.R.C.S.; Bernard Dyer, F.C.S.; Otto Hehner, F.C.S.; W. Morgan, Ph.D., F.C.S; W. Wallace, Ph.D., F.C.S.

The scrutineers also reported that Professor C. R. C. Tichborne, Ph.D., F.C.S., public analyst for Longford County, and President of the Irish Pharmaceutical Society, was elected as a member. Mr. T. P Bruce Warren, analytical chemist, was proposed as a member, and Mr. L. Stansell, assistant to Mr. C. H. Piesse, as an associate. Mr Wigner read a paper by himself and Professor Church "On Two Ancient Samples of Butter" A paper by Mr. Carter Bell, "On the Composition of Unfermented Wines of Commerce," and one by Mr. W. M Hamlet, "On the Estimation of Fat in Milk," were also read.

After the meeting the members dined at the Café Royal, and passed a pleasant evening together.

THE PURIFICATION OF GAS.

By HARRY EDWARD JONES, M. Inst. C.E.

IN dealing with the general subject, the author placed the purification of bisulphide of carbon in the foreground. The late Dr. Letheby in 1860 was responsible for the introduction into an Act of Parliament of a limitation to 20 grains of this impurity per 100 cubic feet of gas. Until the year 1866 no such limitation had been put upon companies outside the metropolis, and since then it had only been imposed in important towns. Such limitations were nowhere enforced or respected Dr. Letheby had an opinion that it was only necessary to resort to the exclusive use of lime as a purifying material; nevertheless it was unsuccessful when adopted in the works of the late Ratcliff Gas Company, an average for two years (1875-6) giving 28 grains per 100 cubic feet. In January, 1872, the Gas Referees reported the impossibility of fixing a limit. In 1877 the failure of the simple lime process led to the adoption of a different plan; the carbonic acid was carefully eliminated. Success was, however, only occasionally attained, and the condition of the gas at the outlet of each purifier in the series was in consequence carefully tested and recorded day by day. Those tests would have been a formidable business but for the introduction at that time of Mr. A. Vernon-Harcourt's colour tests. It was found that though carbonic acid was never allowed to pass the first purifier of a set of three vessels worked consecutively, it was only possible to keep the sulphur low when the third purifier was receiving a considerable quantity of sulphuretted hydrogen. Further, that so soon as the first vessel was taken off for the necessary replenishing, the sulphur rose many grains, and did not fall until the replenished purifier had been put to work again as the third vessel, and its contents had received more sulphuretted hydrogen. This action was illustrated by a table and diagram, as was also the action of a series of four lime purifiers. The advantage of further carbonating the lime on works which were closely surrounded by dwelling houses led to the adoption of the Beckton system. As it became unmistakable that sulphuretted hydrogen was mischievous when in excess, arrangements were made for abstracting it as it left the carbonic-acid system of purifiers by interposing oxide of iron. This was carried out with marked improvement, and the effective life of the sulphide of lime was much prolonged. In practice, both for the relief of back-pressure and for facility in renewing a sulphide of lime purifier, the carbonic-acid set of purifiers should yield the following results:—

	Crude gas.	A	B	C	D	
Sulphur . . .	40	52	45	30	28	Grains per 100 cubic feet.
Carbonic acid	410	300	40	—	—	
Sulphuretted hydrogen . .	800	900	400	—	—	

In this state of things the sulphur was generally 25 per cent. below that in the crude gas.

There was great advantage in exposing the material in the sulphide of lime purifiers to a current of air. Two purifiers at the Wapping Works of the Commercial Gas Company, which had become ineffective, were opened, the lime examined, stirred up, and put back, and they afterwards worked for nine and eight months respectively, and did tenfold more work than previously. The prejudicial effect of cold in the reduction of sulphur in the carbonic acid system of purifiers, and the beneficial effect of the application of heat from the exhaust steam of an engine, were then referred to. No advance had been made in the direction of purifying in closed vessels with liquid agents. Mr. G. T. Livesey had succeeded in eliminating the carbonic acid to 0·5 per cent in volume by the use of rough caustic ammonia liquor. The tar should be separated from the gas immediately on leaving the hydraulic main. The author allowed the gas to leave the condensers in summer at no higher temperature than that of the atmosphere, and in winter than 40° Fahrenheit; in the former case the scrubbers usually reduced the gas to the temperature of 55°, and in the latter raised it to 45°. From the author's practice with water condensers he had found in one type that 1000 cubic feet per diem could be treated by 0·5 square foot of water. The result of condensation on the quality of the gas was then stated.

The purification of crude gas from ammonia proper was next referred to. The process was easy. The essentials were contact with extended superficies of water, or such concentrated intimacy as involved frictional resistance to the gas, and the ultimate exposure of the gas to pure water. No sooner was lime substituted for oxide of iron in the scrubbers than ammonia appeared in the clean gas; this had been lessened by the addition of oxide of iron catch purifiers, and removed by a small quantity of sulphuric acid and sawdust in the last catch purifier. The cost of ammonia purification was very small, the particulars of which were stated.

Sulphuretted hydrogen was easily removed by lime, oxide of iron, peroxide of manganese, and sulphate of iron. Of these purifiers lime was the best, and oxide of iron the cheapest and least offensive. Oxide of iron, sulphate of iron, and manganese converted the sulphuretted hydrogen on exposure to the air into free sulphur, becoming oxides again, and being, as it was called, revivified.

[Abstract of paper recently read at the Institution of Civil Engineers.]

Mr. Albert Clunan, of Brooklyn, N.Y., has invented an improved device for connecting the ends of leather, rubber, canvas, and other belt traces for harness and other bands and straps. It consists in combining a plate with a bar bent, threaded, and provided with an end nut.

AMERICAN PATENT LAW.

We quote the following from the *Scientific American* as showing, that although in many respects the Patent Law of the United States is far superior to our own, yet it has some points in which it is not desirable we should imitate it whenever we can make up our minds to reform the law:—

In the application for patent for vegetable sprout killer by Francis B. Rodgers, filed January 2nd, 1878, the decision of the examiner denying the patent has been overruled by the Board of Appeals. Applicant requests the allowance of the patent by the examiner (unless the utility of the patent is denied) in accordance with the decision of the examiners-in-chief.

The application relates to a compound or mixture for the destruction of vegetable life

One of the grounds upon which the examiner rejected the application was that the mixture was a mere aggregation having no functions differing from those of its several ingredients. The applicant insisted that the compound operated more rapidly and effectually than either of its elements. The examiners-in-chief decided, on appeal, that if the mixture described operated more effectually and rapidly, and was more convenient in use, than its elements, the applicant was entitled to a monopoly of his new compound; but in their decision they stated that they were not informed on this point, and suggested that the applicant should be permitted to file affidavits, under Rule 31, in case the examiner should traverse his assertion that the mixture operated as above stated. Thereupon the applicant requested the allowance of the patent by the examiner (unless the utility of the patent was denied), in accordance with the decision of the examiners-in-chief.

The examiner replied that he did not deny the usefulness or operativeness of the mixture, but denied its patentability.

The applicant appealed to the Commissioner because, as he alleged, the examiner ignored the decision of the Examiners-in-chief; and he asked that the Examiner might be instructed in accordance with that decision.

The commissioner held that, inasmuch as the examiners-in-chief had decided that if the mixture was operative, as claimed, it was patentable in favour of the applicant, although they had not decided whether it was or was not so operative, their decision was obligatory upon the primary examiner, and that it was therefore the duty of the primary examiner, if he did not deny that the compound operated as the applicant claimed, to pass the case to issue; thereupon the appplicant requested that the primary examiner, inas much as he did not deny the operativeness of the invention, should, in obedience to the decision of the commissioner, pass the case to issue without further delay.

The examiner replied that the commissioner's decision was that he should pass the case to issue if he did not deny that the mixture operated more effectually and rapidly than any of its elements; and that, while he did not deny the operativeness of the mixture, he did not deny that it acted more effectually than its component parts. And he added that, while the suggestion of the examiners-in-chief that the applicant should be permitted to submit affidavits would have been consistent with the rules if the examiner had denied the operativeness or usefulness of the compound, nevertheless, inasmuch as he did not deny its operativeness or usefulness, but only denied that it would act more effectually or rapidly or conveniently than any of its elements, affidavits were expressly prohibited by the last clause of Rule 31, in which it it is provided that "affidavits in support of applications will not be received at any stage of the examination unless the office denies that the invention is operative or useful." Upon this action of the examiner the present motion for the transfer of the case to another division is based.

This motion cannot be granted. The primary examiner has not disregarded the decision of the commissioner, nor has he disobeyed the decision of the Board of Examiners-in-Chief; and, while he has declined to comply with their suggestion that applicant should be permitted to submit affidavits in the case, he has done so in the belief that this course was forbidden by the rules of the office. I am not prepared to say that this impression was incorrect.

But I see no good why the applicant should not be permitted, if he can do so, to show that this mixture acts more rapidly and more effectually than the elements of which it is composed, and is more conveniently used. I think that, under Section 483 of the Revised Statutes, I have authority by an order made with the approval of the secretary to authorise him to introduce such affidavits.

It is accordingly ordered that the applicant be permitted, within sixty days after the date of this order, to submit affidavits for the purpose of showing that his compound or mixture operates more effectually or rapidly and is more convenient in use than any of the substances of which it is compounded.

The relief demanded by the applicant is denied.

[Approved by the secretary.]

An undue zeal for the observance of forms and ceremonies is apt to make the ablest officials lose sight of the main object for which they are individually housed in the Patent Office, and for which the patent laws were enacted, to wit: the promotion of the useful arts by the grant of patents to authors and inventors. In times past some of the Commissioners and some examiners seemed to labour under the mistaken notion that the chief purpose of their official life was the opposing of inventors, the placing of obstacles in their way, and preventing the grant of patents.

The foregoing case illustrates our meaning: The examiner in the first place appears to have wrongfully denied the patent. The applicant was then put to the expense of an appeal to the Board of Examiners, who practically decided that a patent should be granted. But the examiner then holds back the patent on a technicality; the applicant is then put to the further expense of appealing to the commissioner in person, who supports the little point raised; which now subjects the inventor to further delays and costs in getting up expert testimony. All the trouble to all the parties concerned would have been avoided had the examiner in the first instance simply issued the patent.

We doubt, says the *Scientific American*, whether there is any instance where a Patent Office mistake made in favour of the inventor ever hurt the examiner, the commissioner, the Secretary of the Interior, or any other official. On the other hand such wrangles as the foregoing are always unprofitable, and do them little credit.

An improvement in sleeping car berths has been patented by Mr. Moritz Leiner, of New York city, N.Y. The object of this invention is to furnish an attachment for car and steamboat berths to facilitate entering and leaving the berths, and to prevent occupants of berths from falling or being thrown out. It consists in providing car and steamboat berths with ladders so constructed as to promote the convenience of passengers in entering and leaving the berths, and as guards to prevent the occupants of the berths from falling or being thrown out.

THE INVENTORS' INSTITUTE.

ESTABLISHED 1st MAY, 1862.

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The various efforts which have been made, and the numerous influences now at work to injure, if not destroy, Patent Rights; the inefficiency of the many well-intended, but ill-considered, Schemes of Patent Law Reform, which have from time to time been suggested, and the tendency of which has generally been to prejudice the Inventor without advantage to the Public; together with the proceedings so essentially involving the interests of Inventors which have already taken place in Parliament, as to the propriety of abolishing Patent Rights altogether, show the necessity of an immediate and active co-operation on the part of those interested in Inventions and in Patent Property, and that an Association for the Protection and Defence of Patent Rights is urgently needed. This Institute has, therefore, been established for the purpose of uniting and organising the influence of Inventors, Patentees, and others. Its objects are:—

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Stamps (revenue), &c.—L. Engel.

Stays.—E. Langdon, W. H. Symington, J. Ulmer.

Steam and other Boilers, Cleaning and Preventing Incrustation of Boilers, Water Feeding Apparatus for Boilers.—G. Preston, C. H. Roockwa, R Langenseipen, S. Dixon, J. McNeil, C. Kesseler (com.), G. Davies (com.).

Steam Engines (Stationary, Locomotive, and Marine).—W. Prowett, J. B. Fell, H. P. Holt and F. W. Crossley, A. M. Clarke (com), W. R. Lake (com.), C. Kesseler (com.), H. W. Jurisch and J. H. Lewis, P. Jensen (com.), G. Stevenson, P W. Willans, A. H. Hearington, J Robb.

Steering Ships and Boats.—W. R. Lake (com.).

Sugar and Syrups Glucose.—W. R. Lake (com), C. D Abel (com.), A E. H. Loge, J. McLaren (com.).

Targets.—R Mansell.

Tarpaulins, &c. O. Jones

Teaching, &c.—J. H. Morley and R. C. Hopper, W. R. Lake (com.).

Telegraphs, Telegraph Printing Apparatus.—J. H Johnson (com.), W. R. Lake (com.), G. F. James, O. Heaviside, F. Wirth (com), G. Wells and A. Gilbert, J. H. Johnson (com.).

Testing Liquids, &c.—G. Budenberg (com.).

Thermometers, &c.—M. Sombart (com.), G. E. Pritchett.

Thrashing Machines, &c.—C. Middleton and P. Everitt.

Threads and Yarns.—G. A. J. Schott.

Tilling and Cultivating, &c.—T. Cooper, A. Macdonell, R. Hancock, E. Loomes.

Tobacco and Snuff, Cigars, Cigar-Holders, Pipe and Cigar-lighters, Smoking Pipes, Tobacco Pouches, &c.—A. Prior, G. Oliver.

Torpedoes, &c.—W. R. Lake (com.).

Toys —J. Block (com.).

Tramways and Tramway Carriages, Tramway, Locomotives.—J Livesey, J. B Carey.

Turning, Lathes for Turning.—W R. Lake (com), J. Simpson.

Upholstery.—G. W. Herbert.

Valves, Taps, Stop Cocks, Plugs, Regulating the Flow and Pressure of Fluids —W. R. Lake (com.), A. M. Clark (com.), J. C. Etchells, J. Shanks and W. Sim, W. Smith, J. Robb.

Velocipedes, Bicycles, &c.—W. Bown and J. H. Hughes, W. Hartcliffe, E. H. Hopkinson, A. and M. Wright, E. H. Hodgkinson, H. Clarke, J. Goodman, W. Soper, W. R. Lake (com.).

Ventilation: Supplying and Purifying Air for Buildings, Mines, Ships, Carriages, &c.—S. S. Hellyer, B. J. B. Mills (com.), W. A. Barlow (com.), J. B. Papier, W. Potts, G. E. Pritchett.

Washing, Cleansing, and Wringing Fabrics, Yarns, and Materials.—W. B. Dick, J. and W. McNaught, J. Whiteford, J. Bell.

Water-Closets, &c.—C. T. H. Brazier, J. Shanks and W. Sim, J. S. Cowe, W. Smith.

Waterproofing, &c.—B. Birnbaum.

Wearing Apparel, &c.—B. Birnbaum, W. A. Barlow (com.), C. T. Mapleston.

Weaving, Braiding, Plaiting, Preparing for Weaving.—D. Armitage, W. S. and R. Collinge, J. Holding, R. S. E. and R. Collinge, C. and T. H Brigg, J. Hamilton, R. Illingworth, J. H. Johnson (com.).

Weighing, &c.—J. Carr.

Wheels for Carriages, &c.—F. C. Glaser (com.)

Windows and Sashes.—W. P. Bonwick, A. S. Nixon, T. Hyatt, R. H. Thompson.

Wine.—L. Dee.

Wire, Wire Working, &c.—F. James, W. R. Lake (com.), Baron Thurlow, G. Wells and A. Gilbert.

Wood and Veneer.—H. A. V. Wirth.

⁂ *The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.*

DETERMINATION OF CARBONIC ACID IN THE ATMOSPHERE.

The amount of carbonic acid in the atmosphere out-of-doors varies but little from day to day and from year to year. Indoors it is quite otherwise. In winter we close the windows to keep out the cold air, and in so doing prevent the exit of the impure air poisoned by combustion of coal in the stoves and oil in our lamps, as well as the exhaled effluvia of the breath To determine the quantity of carbonic acid in a church, school, or theatre is a guide in judging of the success or failure of its ventilation. The usual method consists in drawing a measured quantity of such air through baryta solution and weighing the precipitated carbonate.

Kapusstin has described a quicker and easier method, dependent upon the fact that 70 per cent. alcohol will not dissolve carbonate of soda, while dilute alcohol will do so.

He dissolves ½ gramme of caustic soda in 1 litre of alcohol. He pours 75 c.c. of this solution into a 5 litre bottle full of the air to be tested, shakes it for half an hour, and pours it out, stirs it well, and draws off 25 c.c of the turbid liquid. To this he adds water from a burette until the turbidity, due to undissolved carbonate of sodium, disappears, and multiplies the amount of the water by three. The following formula now gives the number of cubic centimetres (x) of carbonic acid at normal temperature and pressure contained in 5 litres of air, when n is the number of cubic centimetres of water necessary to dissolve the carbonate of sodium:—

$$x = \frac{n - 0\cdot5}{0\cdot55}$$

This method is specially recommended for sanitary purposes as the number of determinations made can be very large.—*Scientific American.*

Mr. Orlando H. Jadwin, of New York city, has patented an improvement in the system of car propelling, in which an endless cable of wire rope is made to travel over a given route by the action of stationary engines, and the cars or other bodies are either connected to the cable to be drawn along by it, or are disconnected from it, by means of a clutch affixed to the car. The invention consists in this clutch or tension device, which is loosely connected with the car and formed of three principal parts—a pulley, a foot for holding the rope to the pulley, and a brake upon the opposite side of the pulley from the foot—these parts being arranged in such relation that a pressure of the brake upon the periphery of the pulley projects the pulley against the rope, and gradually clamps the same between the pulley and foot until the car attains the speed of the travelling cable.

Messrs John Boyd, of Baltimore, Md., and Roy O. Crowley, of New York city, have patented an electrical water indicator for steam boilers, by means of which changes in the height of the water in a steam boiler may operate an electro-magnetic apparatus to open and close the feed water pipe of a steam boiler, to admit and shut off the feed water automatically as required, and to sound an alarm.

Reviews.

"The Disestablishment of the Sun." By JOHN BLAND. London: Sprague & Co., 22, Martin's Lane, Cannon-street, E.C. 1880.

THIS is a shilling pamphlet embodying the views of an investigator who is not content to view things through the ordinary scientific spectacles. We confess ourselves unable to agree with Mr. Bland, although we can fairly say that the arguments he adduces are so cogent that henceforth it will be necessary for those who assert the sun to be wholly and solely the cause of heat, on this planet at least, to carefully study the pages of this pamplet. However, we think Mr. Bland in his zeal to disestablish the sun has gone too far, for to our mind the sun, if not the sole source of heat, is nevertheless the great factor in supplying heat to the earth. Having said this much we are free to add that the work is well worthy of perusal.

"Practical Chemistry;" The Principles of Qualitative Analysis. By WILLIAM A. TILDEN, D.Sc. Lond., F.C.S., Professor of Chemistry in Mason's College, Birmingham. London: Longmans, Green, & Co., 1880

MANY persons may think that there are quite enough works on chemistry for beginners in existence, still we are inclined to the opinion regarding this little work that it will be found useful to those for whom the author has intended the work.

The book is divided into two parts. In the first the student is required to make himself familiar with the appearance and properties of a few substances with which he will afterwards be constantly dealing. He also learns the use of the blow-pipe. The second part is devoted to analysis.

"An Essay on Colliery Explosions and Safety Lamps. By WILLIAM PURDY. London: Colliery Guardian Office, 49, Essex Street, Strand, 1880.

IN a recent number of the *Scientific Review* will be found a paper read by Mr. Purdy on Colliery Explosions and Safety Lamps before the Inventors' Institute This little work under review embodies the paper thus read with additional information which will be found valuable to those interested in our coal mines. A detailed description and drawing of Purdy's lamp is given.

"Murby's Melody Piece Book." Compiled by REV. W. J. DENMAN. Music Revised by THOMAS MURBY. London · Thomas Murby.

THIS little volume contains a collection of melodies with words for school and home use. For schools especially we think the work will be found useful.

REVIEWS POSTPONED.

"The Scientific Structure of the Universe." By JAMES A. MONCREIFF, C.E. (Marcus Ward and Co.)

"Murby's Imperial Copy-books." (Murby.)

CAPSULING BOTTLES.—In France a new system of capsuling bottles has come into vogue which is more rapid than the use of metal capsules, and is thought, by some, to give a more elegant effect. The neck of the bottle is dipped into a viscous volatile liquid and immediately withdrawn with a rotary movement. This leaves a transparent capsule, the effect of which is improved by first attaching a monogram or trade mark to the top of the cork or upper end of the bottle neck. The following is the formula for the liquid:—Yellow resin, 20 parts; ether, 40; collodion, 60; fuchsine, or other tint, *q. s.*

Correspondence.

TURNBULL'S PATENT.

TO THE EDITOR OF THE SCIENTIFIC AND LITERARY REVIEW.

DEAR SIR,—With your kind permission I wish to insert in your valuable journal a few remarks on the construction and mode of working single and compound engines (which was the subject of consideration at the recent meeting of the Inventors' Institute). Many ingenious arrangements have been tried to dispense with cranks, connecting rods, &c., by endeavours to obtain a rotary engine that could be worked with economy and diminished wear. Compared with reciprocating engines, great practical difficulties has prevented their success and adoption.

Reciprocating engines have been much simplified and made on almost every possible plan to diminish the working parts and obtain the most direct motion to the crank when compared with the old type of engines with beams, side levers, &c.; but there is need of a simpler engine, with more direct motion to the crank, to further economise and diminish friction in the working parts. The oscillating engine from its great cost, and the indirect manner of working the valves, causing extra parts, has prevented its general adoption; and the trunk engine, with its great frictional surface and loss of heat by irradiation from the trunks, has prevented it from superseding ordinary engines with connecting rods, motion bars, &c. Improvements recently patented by Mr. W. Turnbull, of which I give a brief description applicable to single and compound cylinder engines, and having fixed cylinders and working the steam valves direct from the eccentric or link motion, dispenses with connecting rods, motion bars, &c., and couples the piston and crank direct by the piston rod; the variable positions of the rod are met by a sliding stuffing-box moving steam tight on the cylinder cover. I likewise use an improved method of varying the expansion in single acting engines by working a small valve on the steam valve, the expansion being altered from the starting lever by the variable travel of the steam valve without additional hand gear, cutting the steam off at an earlier part of the stroke, and maintaining it longer on the piston than the ordinary valve and link motion. The advantage in compound cylinder engines consists in the increased power and economy obtained from the steam by each cylinder communicating with the condenser; the steam is transmitted from the pressure side of the small piston to the pressure side of the large piston by an intermediate valve in the large cylinder steam chest, working in unison with its steam valve; the remaining steam in the small cylinder passes through the intermediate valve to the condenser; steam is supplied to the small cylinder by a plate or block valve, the amount of steam being regulated by an ordinary link motion. With this plan of compound cylinder engine the cylinders can be made of equal diameters without loss of power or economy, which cannot be done in other compound engines without loss.

The exhaust steam in locomotive engines I condense by the continuous cooling of the injection water, forcing it into spray, and exposing it to a current of cold air passing through the condenser produced by the motion of the engine. Any vapour arising from the water is condensed by passing it over a series of metallic tubes, having a current of cold air passing through them by the motion of the engine. In tram-car and stationary engines the air is forced or drawn by a centrifugal fan. A portion of the condensing water is used to supply the boiler; or the steam is condensed over a series of metallic tubes having a current of cold air passing rapidly through them, and the water arising from the condensed steam conveyed to the boiler. These, Mr. Editor, are the advantages obtained by the improvements. —Yours truly,

WILLIAM TURNBULL.

14, Pellant-road, April 28, 1880.

FLUID FOR PRESERVING ORGANIC SUBSTANCES.

M. WICKERSHEIMER, of the University of Berlin, has invented a fluid for the preparation of animal and vegetable tissues, which surpasses anything before known in its power of preserving the colour, form, and elasticity of specimens treated with it.

The fluid may be injected into the veins of the body to be preserved by it, or the entire object may be immersed in it. In either case the elasticity of the tissues and the flexibility of the joints are preserved.

At a recent meeting of the Philadelphia Academy of Natural Sciences, Professor Barbeck described a number of skeletons, which showed beautifully the combined movements of the chest, larynx, and other parts engaged in the mechanism of breathing. Several skeletons of snakes, which had been treated with the fluid more than a year previously, permitted of undulatory and spiral movements. Lungs thus prepared may, even after years, be inflated by means of bellows Such old lungs were seen to swell to ten times their size in the collapsed state, the lobes became distinct, the brown colour gradually changed into red, and the whole organ appeared as if taken from a fresh body. Sections of delicate tissues, morbid formations which have been removed by an operation, will appear after months as if in a fresh state, and may thus be preserved for future study.

'All sorts of vegetable organisms may also be preserved in this fluid. A colony of exquisite fresh water algæ, which had been in the fluid for a year, appeared to be growing in the water.

The Prussian Government has purchased this valuable discovery, and the Minister of Instruction has published it in his official organ for the benefit of the scientific world. The formula for the preparation of the fluid is as follows:—In 3,000 grammes of boiling water dissolve alum, 100 grammes; common salt, 25 grammes; saltpetre, 12 grammes; carbonate of potash, 60 grammes; arsenious acid, 10 grammes. After cooling and filtering, add to every ten litres of the solution four litres of glycerine and one litre of methylic alcohol.

The method of application differs according to the nature of the objects to be preserved Anatomical preparations that are to be preserved dry are immersed in the fluid from six to twelve days, according to their size, then taken out and dried in the open air. Hollow organs, such as the lungs, &c., must be filled with the preserving fluid, then laid in a vessel containing the same liquid, and afterward distended with air and dried. Smaller animals, such as crabs, beetles, lizards, frogs, &c., if the natural colours are to be preserved unchanged, are not to be dried, but put immediately into the preparation. The same fluid may be used for the purpose of preserving human bodies during transportation, or even for more permanent embalming.

HOW COPYRIGHT DIFFERS FROM PATENT RIGHT.

THE Supreme Court of the United States has lately given two opinions which illustrate what mistaken notions of copyright are sometimes held by courts, as well as by lawyers and clients. Some years ago Charles Selden, of Cincinnati, published a book entitled "Selden's Condensed Ledger, or Book-keeping Simplified." In this book, and in one or two others that he about the same time, the author explained a new system of book-keeping which he had invented, and gave such directions, specimen pages, headings, &c., as would enable a person to understand and apply the system. Each of these books was duly copyrighted. Selden claimed that his copyright secured to him a monopoly of the system which he had invented, and demanded a royalty for the privilege of using it. The system appears to have been a desirable one, and the royalty was paid by a goodly number of persons, including not a few county auditors. But others made use of it without asking the inventor's permission or paying any royalty, and one person published a book embodying substantially the same method. Litigation resulted, and the question was raised whether Selden's plan or system of book-keeping was protected by the copyright of his books. The Circuit Court of the United States decided that it was. This judgment is now reversed by the Supreme Court, which does not deny that a work on book-keeping may be the subject of a copyright which will prevent the unauthorised copying of the book. But the system or secret of book-keeping described in the book is not a subject of copyright. This is an invention for which protection, if any there be, should be sought under the patent laws. The court drew a distinction between a book as a composition and the art, process, or secret described in it "A treatise on the composition and use of medicines," says the opinion, "be they old or new, on the construction and use of plows, or watches, or churns, or on the mixture and application of colours for painting or dyeing, or on the mode of drawing lines to produce the effect of perspective, would be the subject of copyright; but no one would contend that the copyright of the treatise would give the exclusive right to the art or manufacture described therein."

In the other case referred to copyright was claimed in a map of New York city constructed on an original and peculiar plan. Substantially the same plan was used without authority in a map of Philadelphia. The United States Supreme Court without denying that the unauthorised publication of the map of New York would be piratical, held that the copyright did not protect the mere plan, and hence did not prevent the defendant from making a map of another city on the same plan.—*N. Y. Times.*

THE EFFECT OF LIGHT UPON SOME REAGENTS AND CHEMICAL COMPOUNDS.

By T. P. Blunt, M.A. Oxon, F.C.S.

(Read before the Society of Public Analysts on March 17, 1880, and reported in the *Analyst* for April.)

The following remarks are for the most part of a practical character, and intended to point out the importance to the chemist of a consideration of the effects of exposure to light upon some of the ordinary reagents of the laboratory, which have not been usually regarded as subject to its influence. My attention was first drawn in this direction in the course of an investigation into the action of light on certain organisms, upon which Dr. A. H. Downes and I have been engaged for more than two years. Nearly all our results have been embodied in a series of papers read before the Royal Society, but it may not be considered impertinent to reproduce here such of them as have a bearing upon the practical question of the preservation of reagents. I do not pretend that all the facts detailed below are new, but some of them have certainly not received the attention they deserve. Oxalic acid forms a most useful basis for a standard solution, owing to the ease with which it is obtained in a pure state by crystallisation, and subsequently weighed, but it has fallen into disrepute on account of the instability of the normal solutions prepared with it; now it has been clearly proved by us that this instability is solely due to the action of light, and that normal volumetric oxalic solution (6·3 per cent.) may be preserved unchanged for any period in the dark. The same remark applies even to the decinormal (0·63 per cent) solution, if the precaution be taken of first boiling to destroy germs or organisms, otherwise it may become turbid and lose strength in the dark. In the light decinormal oxalic solution is rapidly destroyed by oxidation. In one of our experiments made in test tubes, partially filled, and plugged with cotton wool, six months' insolation, between January 21st and June 15th, sufficed to destroy both acid taste and reaction, apparently leaving nothing behind but pure water—the carbonic acid formed having of course escaped I have already, in the columns of the *Analyst*, called attention to the fact that a weak permanganate solution, such as that used by Tidy in water analysis, is perfectly permanent for one month when kept in the dark. My experience extends now over a longer period, and I find that such a solution may be preserved unchanged in the dark for many months in spite of variations of temperature Potassium iodide and ferrous iodide are a pair of compounds whose conduct under light is mutually anomalous; solid potassium iodide in presence of light and moisture soon becomes tinged with yellow through the liberation of iodine, while it is a fact well known to pharmacists that in order to preserve the syrup of iodide of iron (ferrous iodide) from discolouration it should be placed in white glass bottles in the strongest available light. We once half filled a test tube with the syrup and exposed it in a window in the summer. Each morning a brown layer appeared on its surface, the accumulation of the past night. This gradually disappeared in the sunlight, so that before evening the contents of the tube had once more become completely colourless, and this phenomenon occurred as long as the experiment was under observation. It was satisfactorily proved that the only effect of the sugar was to render the solution more stable, for aqueous solutions of ferrous iodide were found to become discoloured much more rapidly in the dark than when exposed to sunlight. Solutions of potassium iodide behave in an exactly opposite manner to those of ferrous iodide in all the respects mentioned above; they become discoloured under sunlight, but can be preserved indefinitely in the dark, and if a dilute solution which has turned yellow in the light be afterwards screened from it, the colour very gradually disappears.

The cause of the discolouration of potassium iodide by light having been much discussed of late years, it may perhaps be worth while to give a somewhat detailed account of our own attempts at the solution of the problem. Four tubes containing a weak solution of the salt, which filled them to about one-third of their capacity, were exhausted at the Sprengel pump; air which had been freed from carbonic and all other acids by long contact and frequent agitation with caustic potash was then admitted by a special arrangement, and the tubes were sealed off; two were insolated and two encased. At the same time some more of the solution was placed in four ordinary test tubes, which were simply plugged with cotton wool, and exposed to sunlight and darkened respectively in a similar manner to the previous pairs. All the insolated tubes rapidly became coloured, no difference being noticeable between the rates of colouration in the tubes containing ordinary and purified air, those kept in the dark being perfectly preserved. A pair of tubes was now charged with solution, exhausted, and sealed off. No change took place on insolation, and thus the somewhat improbable alternative of mere dissociation was disposed of, and the conclusion remained that the effect of light was due to direct oxidation without the intervention of any acid.

There can be little doubt that solution of potassium iodide of any strength could be perfectly preserved in a well-stoppered bottle in the dark, and would be much more convenient than the fragments of solid salt we are most of us in the habit of using. A similar reaction to that observed in the case of potassium iodide under light occurs with dilute solutions of all the alkaline oxalates, which are gradually oxidised with the formation of carbonates, but much less rapidly than a solution of oxalic acid of corresponding strength. In operating on solutions containing the same proportion of acid radical it was found that the decomposition was nearly equal in the case of the oxalates of sodium, potassium, and lithium, but somewhat greater in that of the ammonium salt: hence it would appear to be desirable to keep solutions of ammonium oxalate in the dark when they are required to be preserved of uniform strength, as for instance where they are employed in the volumetric estimation of lime.

In the course of one of our experiments two tubes were partially filled over mercury with a mixture of atmospheric air and ammoniacal gas, one was then exposed to light and the other darkened. On examining the tubes after many months the mercury had risen in the encased tube. The surface of the metal was blackened and its convexity lost, these appearances being evidently due to oxidation. In the tube in the light, on the other hand, the level of the mercury remained unchanged, and its surface was clean, bright, and convex.

These results afford strong presumptive evidence against the formation of ozone in sunlight, and consequently against the views of those writers who have ascribed some of the phenomena of oxidation under light to its intervention, for it is well known that a trace of ozone in air is capable of destroying the convexity and lustre of the mercurial surface.

Dr. Dupré said he heard a similar paper read some time ago, and he went the next day and examined his decinormal oxalic acid which had been made about 14 months, and standing in a place never struck by sunlight. He had some of the exact acid with which it was made, and could certainly find no difference between the two.

Dr. Muter said that had it been in the light it might have been affected. He thought it was probably through germs if any change took place. If no germs could get in it a solution might remain correct for a number of years.

Mr. Hehner pointed out that some germs were not fond of light as they flourished much better in the dark. If fungus were exposed to the sunlight it would very quickly die.

Dr. Bartlett said that he had some potassium iodide which had been for about 20 years in the dark in his laboratory, and it had become of a deep yellow colour.

Electrotyping with Iron.—Herr Böttger describes a process for steeling copper plates by electrolysis. 100 parts of ferrous-ammonia sulphate, together with 50 parts of sal-ammoniac, are dissolved in 500 parts of pure water, a few drops of sulphuric acid being added to acidulate the solution. The copper plate is connected to the negative pole of a battery of two or three Bunsen elements, an iron plate of equal size being employed as an anode. The solution is maintained at from 60 deg. to 80 deg. The deposit of iron is of a hard, steel-like quality, and is very rapidly formed.

SANITARY ENGINEERING.

At the meeting of the Institution of Civil Engineers, on Tuesday, the 13th of April, Mr. W. H. Barlow, F.R.S., President, in the Chair, the first Paper read was on the "Abingdon Sewerage," by Mr. Charles Foote Gower, M. Inst. C.E.

Being under notice to desist from any longer discharging the sewage of their town into the River Thames, the authorities of Abingdon called upon Mr. Bailey Denton, M. Inst. C.E., in the year 1874, to advise them as to the best means of dealing with the sewage, so as to satisfy the requirements of the Thames Conservators. Mr. Denton having, with the assistance of the Author, made an inspection of the town and neighbourhood, recommended that 20 acres of land should be acquired, for the purpose of cleansing the sewage by intermittent filtration, and gave at the same time a general description of the necessary sewers, pumping-station, and other works since carried out.

The population of Abingdon was about 6,000; but provision had been made, in the construction of the works, for at least 10,000 persons. The normal flow of sewage, when undiluted, was taken at 250,000 gallons per day. The ordinary level of the Thames at Abingdon was 162 feet above Ordnance datum. In flood time it reached nearly 167 feet. The River Ock was kept up for the purpose of working mills at a level of 168 feet. The surface levels in the streets of the town varied from about 170 to 200 feet above Ordnance datum. The subsoil water in that part of the town contiguous to the Thames accorded pretty nearly with the river level, 162 feet; but in other parts of the town, previous to the carrying out of the sewerage works, it was regulated by the level of the Ock Mill Stream, and the consequence was that it sometimes rose, in wet seasons, almost to the level of the streets, and proved injurious to the health of the inhabitants. The sewers in Abingdon were formerly very inadequate for the duty required of them; they had been retained, however, in connection with the street gullies, to carry off rain water from the streets. The level of the land selected for the purification and utilization of the sewage varied from 165 to 168 feet above Ordnance datum. From the general surface height and contour of the town, it was impracticable to bring the sewage on to this land without lifting it from 10 to 20 feet from the invert of the outfall sewer. In the design for the new sewers no rain water was to be admitted except from back-yards, roofs, and other surfaces, from which it could not economically be kept out. Having regard to the purification of the sewage, and the necessity for pumping, every precaution was therefore taken to keep the quantity to be dealt with within definite limits. The level of the subsoil water in Ock Street and other places had been reduced by laying separate drains, open jointed, beneath or contiguous to the sewers.

In laying the sewers the joints were caulked with tarred gasket and cement, and in some cases were bedded and surrounded with concrete, or clay puddle, to prevent the ingress of subsoil water or the escape of the sewage into the surrounding soil. Meanwhile, the town having been without a public water supply, arrangements were made for flushing the sewers by inlets from the river and from other sources. The main outfall sewer from the town was 18 inches in diameter, and was capable of discharging 2,000,000 gallons in twenty-four hours, being eight times the estimated dry-weather flow of sewage. The secondary sewers in the town consisted of 15-inch, 12-inch, and 9-inch pipes. The lower portion of the outfall sewer was 3 feet 6 inches in diameter, and served as a reservoir to hold the night flow of sewage, in connection with the pumping station. This sewer was at times subject to considerable internal pressure from the sewage collected in it, as well as to external pressure from the subsoil water outside being 8 feet below the ordinary level of the Thames. Each engine could pump 400 gallons of sewage per minute; thus both engines working together would lift above 1,000,000 gallons per day. In connection with the engines, a storm overflow from the pumping reservoir had been provided, to relieve the latter in case of heavy storms, floods, or accidents to the engines; upwards of 100,000 gallons must flow into the reservoir before any overflow could take place. This provision was more than enough for the night-flow of sewage, if the reservoir was pumped empty at the close of the day. The cost of the sewerage of the town had been £8,750, including a portion of the charge for private connecting sewers, which were executed by the contractor for the main sewers up to the boundaries of private properties on each side of the street. The cost of the engines and pumping station, including fencing of yard, weighing machine, and sewage screens, had been £2,500, of which sum the engines cost about £800. The annual cost of pumping for the last two years had not exceeded £150; but with an increase of water supply it would probably be somewhat greater. The area of land acquired by the Corporation of Abingdon was more than double what Mr. Denton at first proposed. The farm, with cottage and buildings, was let at an annual rental of £1 10s. per acre, the Corporation pumping the sewage. The works were practically completed in 1877, and from that time, with but little exception, the Thames had been free from Abingdon sewage; the land first received it, and after passing through the soil, the effluent water flowed into the river. Samples of the effluent were found by analysis to be better in quality than the water of many of the wells in use in the town. The sewers were freely ventilated throughout the town by shafts, which were also used for inspection and for flushing. The latter operation had to be put into force at least twice a week, owing to the comparatively sluggish flow, the amount of water used for domestic purposes being very small.

The second paper read was on "The Main Drainage of Torquay," by Mr. George Chatterton, M.A., Assoc. M. Inst. C.E.

The Author stated that Torquay, on the northern shore of Torbay, had a population of about 30,000. Previous to 1878 the sewage was discharged into the bay by three outfalls, and was a nuisance at low water and in hot weather. The main sewers were constantly closed at their outlets by the sea, which at high water flowed up a considerable way into the town: many of them were of insufficient capacity, and the ventilation being defective, foul gases were driven into the houses. The scheme described was designed and carried out by Sir J. W. Bazalgette, C.B., V.P. Inst. C.E. Its main features were a high and a low-level system of sewers. The high-level sewer commenced near Tor Abbey, and had an outfall at Hope's Nose, the eastern extremity of Torbay. The set of the tide at the point of outfall was from the bay at all times, and at present no sewage could enter the bay. The total length of the high-level sewer was 17,030 feet, and it was 7 feet in diameter for a length of 11,387 feet; the fall was 1 in 1,177; the level of the invert at the outfall was 4·16 feet below high water of spring tides. The quantity of water brought into the town daily was 600,000 gallons; the dry weather flow of the sewers was about 1,250,000 gallons, the difference being caused by the streams, springs, and overflow of wells, which had been taken into the sewers. In constructing the high-level sewer, it was necessary to drive three tunnels—at Waldon Hill, Meadfoot Hill, and Kilmorie Hill respectively. The Waldon Hill tunnel was in Devonian limestone; it was 1,150 feet long, the size being 5 feet 6 inches by 4 feet; it was driven from two open faces, the average progress was 9·12 lineal feet per week from each face; hand labour alone was employed, and the invert portion was lined with Portland cement concrete. The cost of the sewer completed was £1 10s. per lineal foot. The Meadfoot tunnel was 4,458 feet long; the sewer was 7 feet in diameter. This tunnel was in limestone rock for the greater part of its length, but some of it was in soft ground. Hand labour alone was employed, it was driven from four working shafts; the average progress per week from each face was about 15 feet. Where the ground was limestone it was lined with Portland cement concrete 9 inches thick, while the sewer in soft ground was formed of brickwork. The average cost per lineal foot for driving this tunnel was £1 9s., and the total cost of completed sewer £2 10s. per lineal foot.

A new roadway and sea-wall were constructed along the Meadfoot beach, with the sewer under the road. The sewer consisted of a single ring of brickwork, surrounded with, and founded upon, lias lime concrete carried down to the solid rock. The sea-wall was 1,900 feet long, and was built of random-coursed limestone masonry, backed with rubble. The Kilmorie Hill tunnel was 4,564 feet long. The nature of the rock varied greatly; in some places it was an argillaceous siliceous grit, with bands of pure quartz, and extremely hard; in other places it was of a shaly composition, while near the outfall it was limestone. The advance per week by hand labour was so slow, that it was found necessary to introduce rock-boring machinery at the open face and at one shaft. The progress in feet per week was increased by using rock-boring machinery at the open face in the ratio of 2·33 to 1, and at the shaft in the ratio of 2·19 to 1. The cost per lineal foot was also increased, but not in a corresponding ratio. Ingersoll rock-drills were used, and the air was compressed by Sturgeon's high-speed air compressors. Dynamite was found to be the most effective and economical explosive; 11 tons of it were used without a single accident. There were thirteen ventilating shafts on the high-level sewer. The flow of sewage was continuous, so that sewer gas was not generated to anything like the same extent as in tank sewers. There had been no deposit in the sewer. The low-level system received the sewage of about one-tenth of the population of Torquay; the total length was 5,184 feet. Surface water was kept out of this system as far as possible. The low-level sewage was lifted about 15 feet by a water-pressure engine, with pumps in duplicate. The pumps were worked by a head of 250 feet of water from the town main, and required no superintendence.

A contract for the construction of the works was entered into in 1875, but in January, 1876, the contractors suspended operations, having executed work to the value of about £8000. On receiving fresh tenders the Local Board became alarmed; the lowest tender was £75,000, and this did not include the cost of extra work and other items, which would have involved a total outlay of £103,327, while the engineer's estimate for the same amounted to only £65,000. Under these circumstances the Local Board, acting under the advice of Sir J. W. Bazalgette, determined not to accept any tender, but to execute the works themselves by administration. Mr. G. Phillips was appointed resident engineer, and the whole scheme was completed by August, 1878, or in two years and five months from the commencement of operations by the Local Board. The total cost of the scheme to the Local Board was £66,145, a saving to the town of £37,182 by not accepting the lowest tender. The cost of the Kilmorie tunnel was £14,358, or £3 2s. 11d. per lineal foot. Of this amount, the cost of the driving was 74·53 per cent., of the trimming 15·98 per cent., and of the lining 9·49 per cent. The rock-boring machinery cost £1,395. The execution of the works had involved a rate of about sevenpence in the pound on the present rateable value.

EFFECT OF INTENSE COLD ON BEER.

There are some advantages and many disadvantages to the brewer arising from very cold weather. Beer keeps far better when the thermometer stands below 50° F., but when the thermometer is for days several degrees lower than the freezing point the usual arrangements for storing beer in this country altogether fail to keep it in good condition. The ordinary cellars, both of breweries, retail establishments, and private houses, are but ill adapted to protecting beer from intense cold, and the result has been apparent during the winter in large quantities of beer either turning up cloudy or failing to drop bright: with a reduction of temperature there is a diminished power of holding albuminous bodies in solution, and therefore some of these separate, producing a cloudiness which requires a long period of high temperature to remove again. Another result of cold weather is to cause beer to turn flat; in its normal and healthy state beer should undergo a slow but regularly secondary fermentation, by which a certain amount of carbonic acid gas is evolved which serves to keep up the "life" of the beer; at very low temperatures the organisms which cause this fermentation are inactive, and no gas being evolved the beer becomes flat. The greatest danger to beer during the winter months is the sudden changes of temperature, with the thermometer one day at 55° F. and the next at 25° F. it is impossible to keep beer in condition, at least with the usual cellar arrangements which prevail in this country.

SCIENTIFIC SOCIETIES IN THE UNITED STATES.

At recent meetings of scientific and professional societies in this city, the *Scientific American* states that officers for the ensuing year have been elected as follows:—

New York Academy of Sciences.—President, John S. Newberry; first vice-president, Thomas Eggleston; second vice-president, B. N. Martin; corresponding secretary, A. R. Leeds; recording secretary, O. P. Hubbard; treasurer, J. H. Hinton; council, D. S. Martin, G. N. Lawrence, A. A Julien, A. C. Post, W. P. Trowbridge, Louis Elsberg; curators, B. G. Amend, C. F Cox, B B. Chamberlin, Charles A. Seeley, W. H. Leggett; finance committee, T. B. Coddington, Philip Schuyler, Thomas Bland

American Ethnological Society.—President, Alexander J. Cotheal; vice-presidents, Charles E. West, LL.D., and Charles C. Jones, jun.; corresponding secretary, Chas. Rau; recording secretary, T. Stafford Drowne, D.D.; treasurer, Alexander J. Cotheal; librarian, Henry T. Drowne; and executive committee, George H Moore, LL.D., Asa Bird Gardner, LL.D., and Henry T Drowne.

American Institute of Mining Engineers.—President, Wm. P. Shinn, of St. Louis, Mo.; vice-presidents (in place of those whose term expires this month), James A. Burden, of New York; Dr. Charles B. Dudley, of Altoona, Penn.; and Persifer Frazer, jun., of Philadelphia. Managers (in place of those retiring this month), James C. Bayles, of New York; W. S. Keyes, of San Francisco; and Percival Roberts, jun., of Philadelphia. Treasurer, Theodore D Rand, of Philadelphia. Secretary, Dr. Thomas M. Drown, of Easton, Pa.

RECENT AMERICAN AND FOREIGN PATENTS.

Mr. John Hill, of Columbus, Ga., has patented an improved feed indicator for cotton openers. This relates to a convenient and certain means for determining the quantity of cotton to be fed to cotton openers, which serve to tear up and loosen the tussocks of cotton as they come from the bale, and distribute the fibre in the form of a fleece. In using these openers two are sometimes employed together to act successively upon the cotton, or one opener may be employed in connection with a lapping machine, the function of which latter is to press together and compact into a fleece. In either case a hollow trunk has been employed as a conduit, in connection with a blast of air passing through the same to act as a vehicle to carry the fleece from one opener to the other, or from the opener to the lapping machine, which second machine is generally located upon a different floor, or at a point more or less remote from the first The invention consists in making the boxes of the upper feed roll of the second opener or lapper vertically adjustable, and connecting them with an index hand within sight of the operator at the first machine, so that the operator, at a point remote from the second machine, can tell the amount of cotton fed to the second machine by the rise or fall of the movable roller due to the passage of a greater or less quantity of cotton to the second machine.

An improved stock car has been patented by Mr. Sanford Bray, of Charlestown, Mass. The object of this invention is to furnish cattle cars so constructed that the cattle will be arranged compactly, and can be conveniently loaded and unloaded.

Mr. Eli Shafer, of Sigourney, Iowa, has patented an improved car coupling, consisting of an open-mouthed drawhead, within which is a flat-headed drawbar encircled by a strong spiral spring to force it outward. In the face of the head of the drawbar there is a transverse rectangular groove, within which the flattened end of the link is placed and held by a metallic block The coupling has other novel features which cannot be explained without engravings.

Mr. James E. Purdy, of Tallahassee, Fla., has patented a means for connecting cars, which is so constructed that the cars will couple themselves when run together, and will not be liable to become accidentally uncoupled.

Mr. Ole C. Nuubson, of Mount Horeb, Wis., has patented an improved milk cooler, which consists in a milk cooler with trough, gauges, and faucets, and divided into separate chambers by a diaphragm whose central tube extends through the cover.

Mr. Chas. V. Richards, of Skowhegan, Me., has invented an improved clasp, which consists in a case having its edges so arranged as to form jaws, between which a flanged finger piece is pivoted A wire loop or tongue is adapted to pass through a slot in the case, and has its ends passed through the flanges of the finger piece.

An improved buckle shield, patented by Mr. David Mosman, of New Britain, Conn., consists of a metal plate with curved ends provided with transverse slots and arranged over the buckle, the object being to ornament the harness and to prevent the horse's tail and mane from catching in the buckle.

An improved lubricator, patented by Mr. Oscar A Rollins, of Campello, Mass., relates to the class of oil pumps designed for supplying oil for lubricating purposes to steam engine cylinders. It consists of an oil forcing piston driven with an intermittent motion by connection with some of the moving parts of the engine.

Mr. John F. Curtice, of Fort Wayne, Ind., has patented an improved device for heating sad irons upon the top of a stove. The invention consists in an improved sad iron heater formed of an open bottomed box divided into compartments by vertical partitions, having the middle part of its top stationary and provided with a handle, and the side parts of its top inclined and formed of doors shutting air tight, or nearly so, and provided with spring catches, to adapt the device for use in heating sad irons upon the top of an ordinary stove.

Mr. Henry S. Kratz, of Chicago, Ill., has patented an improved shelf for attachment to stove-pipes for the purpose of supporting culinary vessels, dishes, cloths, or other things requiring to be kept warm or dried.

An improved road-scraper, patented by Mr. Samuel H. Dudley, of Bantam Falls, Conn., consists in the combination of guard bars having their upper ends bent forward at right angles to fit into the notches in the upper edge of the plank, and having sockets formed in their lower parts to receive the rear ends of the draw rods, with the plank, the draw rods, and the staples of a scraper.

Mr. Charles A. Gale, of Piqua, Ohio, has patented an improved apparatus for taking solar prints from negatives. The invention consists in the combination of the two frames, hinged to each other at one edge, and provided at the other edge with a bolt and hand nut or equivalent clamp.

Mr. Antoine B. Dembrun, of New Orleans, La., has invented an improved furnace for cooking and baking, and various other uses. It consists in the combination of a furnace, an iron basket, and a hinged grate to form a compact, convenient, and portable furnace.

Messrs. Cornelius Bennett and Parker Burnham, of Silver City, Territory of New Mexico, have patented an improved apparatus for separating gold and other metals from dirt and sediment by what is known as the "dry" process. The invention consists in a combination of devices which cannot be explained without engravings.

Mr. Solomon B. Ellithorp, of Rochester, N.Y., has invented an improvement in waxing mechanisms for sewing machines. It consists of two arms carrying sponges which are moved reciprocally by the operating mechanism of the machine in such a manner that they pass over melted wax held in a suitable receptacle, taking up a suitable quantity thereof, and at the proper time are rubbed and clasped against the two threads carried by the needle and shuttle

An improved cord adjuster has been patented by Mr. William W. Batchelder, of New York city. The object of this invention is to furnish cord adjusters and holders so constructed that cords may be moved longitudinally through them as required, and may be held securely in place when adjusted. It consists in a cord adjuster and holder formed of a tube having longitudinal flanges or ribs upon its inner surface, an interior swivelled spiral and a swivelled collar, so constructed and arranged that the cord may be moved longitudinally by turning the collar.

Mr. Alfred E. Feroe, of Tivoli, N.Y., has patented an improved process of obtaining wort, which consists in first dissolving the diastase of the ground malt in warm water at less than a converting temperature, and then bringing the mash to and keeping it at a converting heat by continuously drawing the wort from the bottom of the tub, heating, and passing through the mash, as specified.

Mr. Henry S. Kratz, of Chicago, Ill., has patented an improved shelf for attachment to stovepipes for the purpose of supporting culinary vessels, dishes, clothes, or other things requiring to be kept warm or dried.

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Past Presidents :

SIR DAVID BREWSTER, K.H., LL.D., F.R.S., &c., from the establishment of the INVENTORS' INSTITUTE, till his decease, February, 1868. LORD RICHARD GROSVENOR, M.P.

President, SIR ANTONIO BRADY.

THE SESSION 1879—1880

Members' Meetings will be held at 8.15 p.m. on Thursdays, May 6th and June 3rd.

On 6th May, Exposition of Inventions, and Patent Law Questions.

Executive Council Meetings at 7.30, on same evenings as above.

Annual General Meeting, Thursday, May 20th, at 4.30 p.m.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

Proceedings of the Institute.

MEMBERS' MEETINGS.

On the 22nd April Mr. T. Morgan gave an address on some recent inventions of considerable importance, amongst which that of Mr. Turnbull for "Improvements in Compound Engines," &c., engaged nearly the whole attention of the meeting. Mr. Turnbull was present at the meeting, and gave elaborate explanations of all its details. The discussion, in which Mr. F. H. VARLEY, Mr. GREENFIELD, and Mr. CAMPIN took part, was of a general character, in the course of which much approbation of his invention was expressed. A full description of this invention will be found in another column, as also a letter containing further explanation of same.

EXECUTIVE COUNCILS.

On the 8th April no business was transacted requiring to be reported to the members in general.

On the 22nd April the business was financial and routine.

Monthly Notices.

Artificial Felspars was the subject of a memoir by MM. Fouqué and Lévy communicated to the French Academy of Sciences on the 15th of March. The artificial formation of felspars, with base of baryta, strontia, and lead, by the production of crystallisation at a very high temperature, but below the point of fusion, being treated of. The production of minerals corresponding to oligoclaze, labradorite, and anorthite at elevated temperatures is especially interesting just now.

Dr. C. W. Siemens "On the Influence of Electric Light on Vegetation," was the subject of a recent paper at the Royal Society, which strikingly confirms his former statement on the same subject. He exhibited two pots of strawberries which had been grown in the usual way until the fruit buds appeared, when one of the pots was exposed to continuous light—that is, daylight through the day and electric light during the night, the other being left to the influence of ordinary daylight. The contrast between the two pots as exhibited at the meeting was remarkable: one bore a cluster of large, red, fragrant strawberries, the other a bunch still green, with the exception of one slightly red spot. The ripe fruit was the result of the combined light, from which the conclusion is drawn that electric light may be found useful in the ripening of fruit generally. The ripe strawberries were tasted by the President, and pronounced very good.

The London School of Medicine for Women closed its sixth winter session on the 25th ult. Instruction was given in anatomy, practical anatomy, chemistry, physiology, and practice of medicine. Forty ladies availed themselves of these opportunities, of whom twenty were also students at the Royal Free Hospital. A new feature in the arrangements is the establishment of tutorial classes in biology and experimental physics for students preparing for the preliminary scientific examination (M.B.) and first B.Sc examination. During May Dr. Sophia Jex Blake and Dr. Edith Pechey will give a course of lectures to ladies on hygiene.

A New Microphonic Apparatus, which receives words at a distance, is described by MM. P. Bert and d'Arsonville in the *Comptes Rendus* of the Académie des Sciences. The objects of their researches have been twofold: first, to strengthen the sound vibrations of speech, and, secondly, to collect these vibrations at the distance of several metres from the speaker.

A New Form of Lamp for the Electric Light has recently been invented by Mr. Charles Stewart, M.A. It consists of a number of square carbon rods placed radially upon a disc of wood or metal in such a manner that the inner ends of the carbon rods form a complete circle. There is a circular opening in the wooden disc through which the electric light is seen from underneath. The carbons, which are all forced towards the centre by a uniform pressure, move forward as they are consumed, and together form the positive electrode of the lamp. The negative electrode consists of a covered hemispherical cup of copper, which, before the current enters the lamp, rests upon the ring formed by the carbons. On the current entering the lamp an electro-magnet raises the metal electrode, and the electric arc is then formed between the circle of carbons and the metal electrode. There is a flow of water through the latter to keep it cool. The advantages which this lamp possesses are—1. It is automatic in its action. 2. It is capable of burning for a very considerable period. 3. It does not throw any shadows. 4. It is of simple and comparatively inexpensive construction. 5. The intensity of the light may be increased if so desired. This is the second lamp for the electric light which Mr. Stewart has recently invented.

Underground Currents of Electricity.—Two Americans, Messrs. Prescott, profess to have discovered that underground currents of electricity, flowing in all directions, form the true "earths" of lightning discharges. They assert that all houses, trees, &c., struck by lightning are underflowed by these currents, and that no houses, &c., standing on spots where there are no currents are ever struck. In protecting a house from lightning stroke, therefore, their method is to test the ground underneath, and if there are no earth-currents below to take no further trouble; but if these currents are present, to earth the rod, which they erect in the parts of the ground below where they are strongest,

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MAY, 1880.

THE HORTICULTURAL VALUE OF THE ELECTRIC LIGHT.

ARCTIC explorers have frequently remarked that vegetable productions which in temperate climates require a long time to grow to any perfection mature in a few weeks under the continuous sunshine of the Arctic summer. A similar rapidity of growth is shown by annuals in subarctic latitudes; for instance, in Northern Norway the summer sun, though never reaching a high altitude, yet remains above the horizon from sixteen to twenty hours per day.

A species of corn which flourishes in Canada is said to have failed to ripen in Kentucky, though the warm season there is some weeks longer than in Canada. The superior rapidity with which vegetation pushes forward during periods of full moon and light nights has also been widely noticed; these facts of general observation, with others of a more experimental character, going to show that many of the plants of our temperate climate thrive in proportion to the duration of the daily (direct or indirect) sunshine they enjoy, rather than according to the temperature of the air.

A curious confirmation and extension of these observations in regard to the influence of light upon vegetation is furnished by the recent experiments of Dr. C. W. Siemens, testing the influence of the electric light upon certain plants. These experiments were described by Dr. Siemens at consideraale length at a late meeting of the Royal Society. According to the report in the *Times* the method pursued by Dr. Siemens was to plant quick-growing seeds and plants, such as mustard, carrots, ruta-bagas, beans, cucumbers, and melons, in pots, dividing the pots into four groups, one of which was kept entirely in the dark, one was exposed to the influence of the electric light only, one to the influence of daylight only, and one to daylight and electric light in succession. The electric light was applied for six hours each evening—from 5 to 11—and the plants were then left in darkness during the remainder of the night. The general result was that the plants kept entirely in the dark soon died; those exposed to the electric light only or to daylight only throve about equally; and those exposed to both day and electric light throve far better than either, the specimens of mustard and of carrots exhibited to the society showing this difference in a very remarkable way. Dr, Siemens considers himself as yet only on the threshold of the investigation, but thinks the experiments already made are sufficient to justify the following conclusions:—

1. That electric light is efficacious in producing chlorophyl in the leaves of plants, and in promoting growth.

2. That an electric centre of light equal to 1,400 candles placed at a distance of two metres from growing plants appeared to be equal in effect to average daylight at this season of the year; but that more economical effects can be obtained by more powerful light centres.

3. That the carbonic acid and nitrogenous compounds generated in diminutive quantities in the electric arc produce no sensible deleterious effects upon plants enclosed in the same space.

4. That plants do not appear to require a period of rest during the twenty-four hours of the day, but make increased and vigorous progress if subjected during daytime to sunlight and during the night to electric light.

5. That the radiation of heat from powerful electric arcs can be made available to counteract the effect of night frost, and is likely to promote the setting and ripening of fruit in the open air.

6. That while under the influence of electric light plants can sustain increased stove heat without collapsing, a circumstance favourable to forcing by electric light.

7. That the expense of electro-horticulture depends mainly upon the cost of mechanical energy, and is very moderate where natural sources of such energy, such as waterfalls, can be made available.

In the discussion which followed the reading of the paper it was pointed out that the evidence seemed to show the practical identity of solar and electric light with respect to their action on vegetation; and it was suggested that the method of subjecting plants to electric light might afford great facilities for the scientific investigation of the influence exerted by light, as compared with other agencies, in promoting the formation of the active principles or most valuable constituents of plants, such as the quinine of the cinchona bark, the gluten of wheat, &c. Before concluding his observations, Dr. Siemens placed a pot of budding tulips in the full brightness of an electric lamp in the meeting room, and in about forty minutes the buds had expanded into full bloom.

If, as we are inclined to believe, the electric light is an artificial sunshine we are by no means surprised to find the results of Dr. Siemens's experiments have been such as they have, but nothing could well be more conclusive as showing the importance of the electric light than the facts established by the researches of Dr. Siemens.

Owing to the fact that the production of the electric light is at present so difficult and expensive that its use is looked upon rather as a matter of luxury than of ordinary requirement, one cannot regard these experiments of Dr. Siemens's as practical utilities, but for all that a wide field of progress is opened up by them, and we shall be much surprised if at no distant period these researches do not become the foundation of practical improvements in horticulture of first rate importance.

Proceedings of Societies.

ROYAL SOCIETY.

FEB. 26TH.—The President in the chair.—The following papers were read: "On the Solubility of Solids in Gases," by Messrs J. B Hannay and J. Hogarth; and "On the Artificial Formation of the Diamond: Preliminary Notice," by Mr. J. B. Hannay.

MARCH 4TH.—The President in the chair.—The list of names of the candidates for election into the society was read. The following papers were read: "Fired Gunpowder: Note on the Existence of Potassium Hyposulphite in the Solid Residue of Fired Gunpowder," by Capt Noble and Mr. F A. Abel; "On the Dynamo-Electric Current, and on certain Means to Improve its Steadiness," and "On the Influence of Electric Light upon Vegetation, and on certain Physical Principles Involved," by Mr. C. W. Siemens.

MARCH 18TH.—The President in the chair.—The following papers were read. "On the Structure of the Immature Ovarian Ovum in the Common Fowl and in the Rabbit, with Observations on the Mode of Formation of the *discus proligerus* in the Rabbit, and of the Ovarial Glands or 'Egg Tubes' in the Dog," by Prof. Schafer, "Researches into the Colouring Matters of Human Urine, with an Account of the Separation of Urobilin," by Dr. M'Munn; "On the Analytical Expressions which give the History of a Fluid Planet of small Viscosity, attended by a single Satellite," by Mr. G. H. Darwin;" "On the Modifications of the Spectrum of Potassium which are effected by the Presence of Phosphoric Acid, and on the Inorganic Bases and Salts which are found in Combination with Educts of the Brain," by Dr. Thudichum; "On Magnetic Circuits in Dynamo and Magneto-Electric Machines," No. II., by Lord Elphinstone and Mr. C. W. Vincent; "On the Coalescence of Amœboid Cells into Plasmodia, and on the so-called Coagulation of Invertebrate Fluids," by Mr. P. Geddes; and "Some further Observations on the Influence of Electric Light on Vegetation," by Mr C W. Siemens. The society adjourned over the Easter recess to Thursday, April 8th, at half-past four in the afternoon.

GEOLOGICAL SOCIETY.

FEB. 20TH —Annual General Meeting.—H. C. Sorby, Esq., President, in the chair — The secretaries read the Reports of the Council and of the Museum Committee for the year 1879 The Wollaston gold medal was handed to Mr. H. Bauerman, for transmission to Prof. A. Daubrée; the Murchison medal and the proceeds of the Murchison donation fund to Mr. R. Etheridge; the Lyell medal to Mr J. Evans, the balance of the proceeds of the Wollaston donation fund to Mr T. Davies; and to Prof. Seeley the balance of the proceeds of the Lyell fund, for transmission to Prof. F. Quenstedt. The President then read his anniversary address. The ballot for the Council and officers was taken, and the following were elected: President R. Etheridge; Vice-Presidents, Sir P de M. Grey-Egerton, Bart., J. Evans, J. W. Hulke, and Prof. A. C. Ramsay; Secretaries, Prof. T. G. Bonney and Prof. J. W Judd; Foreign Secretary, W. W. Smyth; Treasurer, J G Jeffreys. Council, Rev. J. F. Blake, Prof. T G. Bonney, W. Carruthers, Sir P. de M. Grey-Egerton, Bart.. R. Etheridge, J. Evans, Lieut.-Col. H. H. Godwin-Austen, J. C. Hawkshaw, H. Hicks, W H. Huddlestone, Prof. T. M'K. Hughes, J. W. Hulke, J G. Jeffreys, Prof. T. R. Jones, Prof. J. W. Judd, Prof. N. S. Maskelyne, J. Morris, J. A. Phillips, Prof. J. Prestwich, Prof. A. C. Ramsay, Prof H. G. Seeley, W. W. Smyth, and H. C. Sorby.

FEB. 25TH.—R. Etheridge, Esq., President, in the chair.—Messrs. J. H. Cowham, W. A. Forbes, M. H. Gray, and C. T. Whitmell were elected Fellows. The following communications were read: "On the Geology of Anglesey," by Prof. T. M'K. Hughes; "Notes on the Strata exposed in laying out the Oxford Sewage-Farm at Sandford-on-Thames," by Mr. E. S. Cobbold; and "A Review and Description of the various species of British Upper-Silurian Fenestellidæ," by Mr. G. W. Shrubsole.

MARCH 10TH.—R Etheridge, Esq., President, in the chair.—Mr. J. Ward was elected a Fellow; and Prof. F. von Hochstetter, of Vienna, and Prof. A. Renard, of Brussels, foreign correspondents of the society. The following communication was read: "On the Geological Relations of the Rocks of the South of Ireland to those of North Devon and other British and Continental Districts," by Prof. E Hull.

SOCIETY OF ANTIQUARIES

FEB. 26TH.—E. Freshfield, Esq., V.P., in the chair.—Notice was given of a ballot for the election of Fellows on Thursday, March 4th Mr R. Nevill exhibited an inscribed block of terra-cotta 8 in. by 11½ in in surface, and 8 in. deep, which came from the old gatehouse at Esher Place, Surrey, to which Cardinal Wolsey was at first banished. It is not, however, certain that it belonged to the house. On the face of it was a buckle, the Pelham bade, and around the buckle was the legend, LAN DE GRACE 1534 FUT CEST MAYSO FAICTE. In the centre of the badge are the letters W P., which no doubt are intended for Sir William Pelham, of Sussex, who succeeded to his estates in 1516, and died in 1538. Mr. W. K. Foster exhibited a pair of brass snuffers of the sixteenth century, found in a house at Bishop's Stortford, and a tobacco stopper, with a head of Charles I The snuffers very closely resemble a pair figured in the "Catalogue of Works of Art and Antiquity," published by the Company of Ironmongers (p. 221). Commander Telfer exhibited a bronze plaque or bas-relief, representing the entombment of our Lord Mr G L. Gomme, F.S A., read a paper "On Open Air Courts of Hundreds and Manors" After claiming for his study the adaption of a new title, namely, "Primitive Politics," Mr. Gomme proceeded to give a summary of the special value attached to the subject of open-air courts. By the custom of holding assemblies in the open air being found to exist among many primitive peoples, it was shown that it belonged to primitive life, and that, therefore, the examples to be met with in England at the present day were really survivals of a primitive stage of society. Limiting the present paper to examples of courts of hundreds and manors only, Mr. Gomme investigated the following hundred courts Humbleyard, Clackclose, Taverham, Grimeshou, Forehou, Greenhoe, Smethdon, Freebridge, Gallow, Lynford, Depowade, Mitford, Erpingham, Launditch and Earsham in Norfolk, Stone in Somersetshire, Alwicke and Younsmere in Sussex, Swanborough in Wilts, and Knightlow in Warwickshire. The manor courts were shown to give evidence of the assembly of the primitive village community, and Mr Gomme enumerated Aston in Oxfordshire, Somerton in Somersetshire, Pamber in Hampshire, Rockford in Essex, Warnham in Sussex, and many others.

MARCH 4TH.—E. Freshfield, Esq., V.P., in the chair —This being an evening appointed for the ballot, no papers were read; but Mr. Freshfield exhibited his own collection of Sarum Missals and Manuals, early Primers, Primers, Prayer Books, Bibles, Acts of Parliament, Injunctions, and the like, connected with the history of the Book of Common Prayer. Mr. Micklethwaite also exhibited some illuminated leaves of a Latin service book noted, which had been adapted for post-Reformation use, all allusions to the Papacy being erased. In consequence of the lack of vacancies, only two candidates were elected, viz., Mr. S. W. Kershaw and Mr. E. M. Thompson. The latter gentleman was proposed by the Council.

MARCH 11TH.—F. Ouvry, Esq., V.P., in the chair.—The Rev. W. C. Lukis laid before the society his Report on the Prehistoric Monuments of Devon and Cornwall, which he had visited, explored, and planned last summer at the request of the Council, and with the pecuniary aid of the society. The report was illustrated by thirty-six large sheets and twenty-seven smaller sheets of careful plans and drawings to scale, the result of the accurate survey and measurements of fifty-six monuments, consisting of twelve monoliths, one line of monoliths, eleven holed stones, thirteen large circles, seven cromlechs, four chambered barrows, four cisted barrows, and four dwelling enclosures. Of all these monuments Mr. Lukis laid before the society an interesting tabulated report, drawn by Mr. W. C. Borlase (to whose assistance in surveying the prehistoric monuments of Cornwall Mr Lukis said he was deeply indebted), giving a list of the monuments in the order in which they were planned; the names, if any, by which they were popularly known; the parishes in which they are situated, and how they may be reached, the proprietors' names and residences, the printed books and MSS. in which they are described; and the discoveries which have been made in or near them On the value of such a list it is needless to insist. The same may be said with still greater force of the plans which lay upon the table in profusion These monuments are in daily danger of being mutilated or destroyed altogether; and a series of plans such as those, so carefully executed—but only if carefully executed—preserves a faithful record of them in the condition in which they are now, and furnishes means of comparison with the monuments of other countries and races. While Mr. Lukis was reading his paper, the president, the Earl of Carnarvon, entered the room, from which illness had for many months kept him away, and was warmly received by the Fellows. He came from the House of Lords to announce that Sir J. Lubbock's Bill had for all practical purposes been thrown out that evening, having been referred to a Select Committee. The two principal reasons for the opposition it had met with were, (1) the interference which the Bill, as it was alleged, exercised with the rights of private property, and (2) the machinery by which it was proposed to work the Bill, viz., the trustees of the British Museum. With Mr. Lukis's plans on the table it was impossible not to feel that the publication of such a series of the prehistoric monuments of this and other countries would be the most efficacious substitute for a measure which, after a seven years' struggle, had been passed with such difficulty through the House of Commons, and had virtually been thrown out in the House of Lords. As Lord Carnarvon observed in his anniversary address last year, the real point to aim at is an archæological survey of Great Britain. No measure for the preservation of ancient monuments can be really efficacious until it be known what they are, where they are, and whose they are. In reply to Mr. Borlase, who expressed a wish that the plans then exhibited should be published, the Director stated that the matter of such a publication had been very fully considered by the council, and that estimates had been obtained. He hoped if the project met with adequate support that the council might see their way to carry it out. The great result of Mr. Lukis's report, and of all the other plans he has executed, goes to show that "all now uncovered dolmens were once enclosed in barrows; that none were erected as cenotaphs on the summits of artificial mounds; and that no such class as that which has been designated as earth-fast or demi-dolmen exists." Mr. Lukis proceeded to read a second paper on "Egyptian Obelisks and European Monoliths Compared." Egyptian obelisks served successively, and speaking roughly three purposes: first, they were sepulchral, and erected before the entrances of tombs; secondly, they were placed (in the eleventh and twelfth dynasties) before the temples of kings, and were no longer sepulchral; thirdly, they had a triumphal character, like the triumphal columns of the Romans. Mr. Lukis's object was to show that it was only in the first class, *i.e.*, of sepulchral monuments, that we must look for the counterparts of the rude monoliths of Europe—a theory which receives some not unimportant confirmation from the existence of ancient monoliths in churchyards, such as at Rudston, and at several places in France.

MAR. 18TH—E Freshfield, Esq., V.P., in the chair. Mr. J. Clarke exhibited and presented an illuminated calendar of the fourteenth century, which had been described at the opening meeting of the Society (November 27th, 1879) by Mr. Freshfield.—The Rev. B Webb exhibited an ancient antependium or altar frontal from Alverly Church, Salop. Such altar frontals of as early a date as this are extremely rare—indeed, Mr. Webb did not himself know of the existence of another. In the centre was a representation of "Abraham's Bosom," a quaint conceit, quaintly represented, Abraham holding with extended arms a cloth in which were the souls of the blessed—The Rev. Canon Jackson exhibited, by permission of the Marquis of Bath, an early deed and seal, being a grant of land at "Horslee and Horninton" (Oxon) from William de Colville to Bertram de Verdun. The seal, of which only a fragment remained, seemed to have on it a female effigy with long hanging sleeves; but across where the waist would come the field of the seal was traversed by a horizontal bar, a quarter of an inch wide, the significance of which was obscure.—Mr C. S. Perceval communicated miscellaneous remarks on various seals, and more especially on those of Dartford Priory.

ROYAL SOCIETY OF LITERATURE.

FEB. 25TH—W. Knighton, Esq., in the chair. Mr. R. N. Cust, in a paper "On late Excavations in Rome," gave an account of the recent researches in that city, which have been mainly due to the energy and zeal of the Emperor Napoleon III, of Mr J. H Parker, and of the present Italian Government. In the course of a rapid but clear survey. Mr Cust dealt especially with five particular portions of the area of Rome which have been the scene of successful explorations, viz.:—1, the Palatine Hill, the site of the house of Augustus and of the palaces of the later emperors; 2, the Forum; 3, the Baths of Titus and the Colosseum; 4, the Baths of Caracalla; 5, the banks of the Tiber within the city. The paper was illustrated by maps kindly lent for the purpose by Mr. J. H. Parker and Mr. J. Murray.

MAR. 17TH.—Sir P. de Colquhoun, Q.C., in the chair. Mr. Wellsman, the editor of the *Newspaper Press Directory*, was elected a Fellow. Mr. J. W. Redhouse read a paper "On a Theory of the Chief Human Races of Europe and Asia," in which he combated the usually received views of the spread of the Aryan tribes north-west into Europe, and south-east into India, from the high plateau of Pamir in Central Asia. He based the theory that he advanced, viz., that they really came from the north-west Polar regions, on the consideration of the map and geology of the Old World of Europe, Asia, and Africa, guided by such fragmentary traditions of sudden upheavals or subsidences as have been more or less corruptly preserved and handed down to us, which seem to show the probability that this portion of the earth's surface may in some prehistorical age have consisted of several distinct continents, islands, or archipelagoes. Each of these must have been tenanted by a Fauna and a Flora nearly, if not quite, peculiar to themselves, just as America, Australia, and New Zealand were found to be when first discovered by Europeans. Certain it is that over this whole range a tropical climate must once have prevailed, and perhaps over the ideal lost continent also. Mr Redhouse's paper was illustrated by six skeleton maps, showing the successive alteration of the earth's surface he considered most likely.

LINNEAN SOCIETY.

FEB. 19TH.—W. Carruthers, Esq, V.P., in the chair. Mr E. S. Baikie was elected a Fellow. Mr. J. Britten exhibited stems of *Myrmecodia echinata* and *M glabra*, recently sent from Borneo by Mr. H. O. Forbes, showing the galleries formed by a species of ant allied to, if not identical with, *Pheidole Javana*, Mayr. Specimens of very young plants were also shown, all of which had been attacked by the ants. Signor Beccari, who had studied Myrmecodia in its native localities, asserts that the presence of the ants is essential to the plant's existence, for unless the young plants are attacked by the ants they soon die. Dr. M. Masters also brought forward a pitcher plant, *Nepenthes bicalcarata*, from Borneo, and read Mr. Burbidge's notes thereon. These pitchers are perfect traps to creeping insects from the incurved spinous ridges round the throat. To take advantage of the prey, a species of black ant ingeniously perforates the stalk, and thus provides a safe inroad and exit whereby to avail itself of the sumptuous fare of dead and decaying insects contained in the reservoir The remarkable Lemuroid, *Tarsius spectrum*, likewise visits the pitcher plants for the sake of the entrapped insects. These it can easily obtain from the *N. Rafflesiana*; but not so from the *N. bicalcarata*, where the sharp spurs severely prick if Tarsius dares to trifle with the urn-lid. Dr. J. E. T. Aitcheson read a paper "On the Flora of the Kurum Valley, Afghanistan." The 950 species collected point to the district in question being a common meeting ground of Perso-European, Chinese-Tibetan, and Himalayan floras. In the Kuram and Hariab Valleys the Deodar, our finest Himalayan timber tree, forms dense forests, doubtless valuable hereafter for exportation. *Chamærops Ritchiana*, a branching palm twenty feet high when uninjured, forms only an aloe-like scrub on the dry plateau west of the Darwaza Zar Pass. The author describes new species belonging to several genera, among others Acantholimon, Astragalus, Rosa, Rhododendron, &c. A dozen species or more of ferns were met with, and *Nephrodium rigidum*, most characteristic, was proved to have an Afghan residence. Dr. Aitcheson interspersed his technical data by interesting information concerning the native uses of the plants.

MARCH 4TH—Prof. Allman, president, in the chair. The following gentlemen were elected Fellows:—Messrs S. M. Bairstow, J. T. Carrington, R. M. Middleton, S. O. Ridley. T. C. White, and Prof P M. Duncan Dr. Middleton exhibited two skulls of *Babirussa alfurus*, Less., from Borneo, which, though quite adult, were both distinguished by the unusual smallness of their tusks. Dr. Gunther brought forward two deep-sea fishes obtained during the Challenger expedition (Echiodon and Scopelus) to illustrate two kinds of luminous metameric organs, first distinguished by Dr. Ussow, which he described and designated as the lenticular and glandular kinds. Whilst admitting the great morphological resemblance of the former to an eye, he (Dr. Gunther) gave reasons which induce him to dissent from the view that they are organs of vision. He showed that their structure was not opposed to the view that they, like the glandular kind, are producers of light, and that probably this production of light or luminosity is subject to the will of the fish. Mr. J. Jenner Weir, on behalf of Mr. E. A. Nevill, showed the stuffed head of a prong-buck (*Antilocapra Americana*), shot by the latter in the Rocky Mountains in August, 1876. On the median nasal region of this specimen what appeared to be a short unbranched third horn was developed. On discussion of the abnormality, it was suggested as being rather an elongated warty growth than a true horn after the type of the rear ones; a further careful examination into its structural conditions was recommended Mr. E. M. Holmes read a paper "On *Codiolum gregarium*, A. Braun, a new British Alga discovered at Teignmouth by the Rev. R. Cresswell." The author considered that the hypnospores described by Braun did not belong to Codiolum, but to another Alga usually found growing with it. The growth of the plant and its fructification, contrary to Braun's supposition, lasts through the winter and spring. Mr Holmes also exhibited specimens of the fructification of *Chætopteris plumosa*, found in Britain for the first time by Mr G. W. Traill, of Edinburgh. The unilocular sporangia in this instance were in a more advanced stage than those figured by Areschoug, and the multilocular sporangia differed in character from the illustration given by the last-mentioned Swedish naturalist. Mr. F Day briefly recounted the peculiarities and descanted on the geographical distribution of the Hebridal Argentine, a fish rarely met with in British waters, but nevertheless of considerable interest.

MAR 18TH.—Prof Allman, President, in the chair The death of Prof. T Bell, a former President of the Society, was announced from the chair, and remarks made regarding his valuable labours as a zoologist, especially concerning British animals.—Mr. T. Christy exhibited a collection of dried flowers from Western Australia made by Mrs. Bunbury. She observes that the once common native flowers are becoming rapidly scarce in the pasture land of the colony, and that it is even difficult to propagate them by culture.—There were exhibited for Mr. J. T Carrington a male and a female example of the Northern stone crab (*Lithodes Arctica*), which had lived in the Westminster Aquarium. The peculiar asymmetry of the abdominal segments of the female was adverted to, and from this and other reasons an affinity with the hermit crabs pointed out.—The Secretary read a communication from Mr. H. M. Brewer, 'On the Indigenous Timber and on Plants introduced into New Zealand.' Among the former, Manaka (*Leptospermum ericoides*) is useful for spokes, tool handles, &c.; Kowhai (*Sophora tetraptera*) forms admirable material for carving, &c., Totara (*Podocarpus totara*) is most durable for piles, railway sleepers, &c.; red birch (*Fagus fusca*), on account of its strength, is well adapted for beams and framework; and the Matai (*P. spicata*) is so durable that a prostrate tree found in damp bush, and supposed to have lain there for a couple of centuries, still retained its soundness when cut up. Of plants introduced quite a host thrive out of doors: among others the coral tree (*Erythrina caffra*), with its brilliant scarlet flowers, and *Fourcroyia gigantea*, which produces a fine fibre, as does also *F. flavaviridis*. *Chamærops excelsa*, *C. humilis*, *Musa textilis*, and *M. sapientum* equally thrive; the banana ripens good fruit. The pomegranate and olive hereafter are likely to become important commercial products. The Natal plum

(*Arduina grandiflora*), the fig, custard apple, ginger, the tallow tree (*Stillingia sebifera*), cinnamon, camphor, orange, lemon, citron, and many others, attest a climate and soil of great capabilities. A great number of species of pines and Auracarias thrive well, and oaks, elms, and poplars take quite naturally to the country.—A paper from Prof Westwood, 'On a Supposed Polymorphic Butterfly from India,' was read. His results are in favour of, first, *Papilio Castor* being males of a species whose females have not hitherto been discovered; second, that the typical *P. Pollux* are females, of which the male, with rounded hind wings having a diffused row of markings, has yet to be discovered; and third, that the coloured figures shown by the author represent the two sexes of a dimorphic form of the species.

BRITISH ARCHÆOLOGICAL ASSOCIATION.

MARCH 17TH.—Mr H. Syer Cuming in the chair. It was announced that the "Thinghow," a curious artificial hill at Bury St. Edmunds, had been opened, and had proved to be a large British barrow. Other interesting discoveries at Winchester and at Wolvesley Castle were announced.—Mr. J. Brent described a Saxon interment which has been recently found at Canterbury and which contained various bronze articles of unusual form.—Mr. Way reported further discoveries of Roman pottery and other articles at King's Arms Yard, Southwark, and among these was a fragment of a pavement, showing that the site was that of a building, probably a villa.—Mr L. Brock described to Roman bronze statuettes, of Hercules and Venus respectively, and Mr. G. G. Adams a finely carved crucifix and a religious painting of Flemish work, dated 1645—Dr. Kendrick exhibited a vessel in form of a bull, of terra cotta of early Spanish work, and not unlike in design some rare examples of English make.—The first paper was by Mr T. Morgan, 'On certain Grants of Land in Mercia in 770.' The lecturer referred to the description by Mr. de Gray Birch of a little known charter belonging to the Dean and Chapter of Worcester, in which reference was made to the granting of land for three lives by King Offa; afterwards the land, which belonged to the Church, was to revert to the Church. The crippling of the king's resources by so much land being in Church patronage was alluded to, and it was supposed that the grant was made by Offa to equalise this, after the manner of similar acts by Charlemagne. Many curious references were pointed out, allusions to boundaries of estates, the offices of Regulus and Sub-Regulus, and especial reference was given to the little studied transition of municipal government from Roman times to Saxon.—The second paper was by Dr. R. A. D. Lithgow, 'On the Orthography of Shakspeare's Name." It was founded on the lately privately-printed pamphlet by Mr. Halliwell-Phillipps, and advocated in a similarly conclusive way the long mode of spelling the name. Mr. Wright afterwards referred to Mr Halliwell-Phillipps's suggestion that that the hitherto thought "s" in the famous signature of the will is, after all, the well-known contraction for "es." If so, this conclusively settles the question in favour of the name being spelled the long way by Shakspeare himself.

METEOROLOGICAL SOCIETY.

FEB. 18TH.—Mr. G. J. Symons, Esq., president, in the chair. Dr. J. S. Cameron, Dr. F. F. Carey, Messrs. J. B Charlesworth, A. Collenette, S. Forrest, J. G. Gamble, H. J. Marten, J. Hixon, W. P. Propert, S. Rostron, W. P. Swainson, and E. W. Wallis were elected Fellows. The papers read were "On Typhoons in China, 1877 and 1878," by Lieut. A. Carpenter, R.N.; "Note on the Reports of Wind Force and Velocity during the Tay Bridge Storm, Dec. 28th, 1879," by Mr. R. H. Scott. These reports seemed to show that the velocity of the wind on that occasion was not so high as was generally supposed, and had been frequently exceeded, but that some of the gusts were very violent; and "On the Frost of December, 1879, over the British Isles," by Mr. W. Marriott.

MARCH 17TH.—Mr. G. J. Symons, president, in the chair. Sir A. P. B. Chichester, Mr. W. H. Cochrane, Rev. H. Garrett, Mr. H Jonas, Mr. J. Lingwood, Lieut.-Col. L. W. Longstaff, Rev. C. E. Sherard, Mr. J. H. Stewart, and Dr. W. J. Treutler were elected Fellows. The following papers were read:—"Thermometric Observations on board the Cunard R.M.S.S. Algeria," by Capt. W. Watson; and "On the Greenwich Sunshine Records, 1876 80," by Mr. W. Ellis.

INSTITUTION OF CIVIL ENGINEERS.

MARCH 2ND.—Mr. Brunlees, V.P., in the chair. The monthly ballot resulted in the election of Messrs. A. Ellis and H. J. Fraser as members; of Messrs. F. Abercrombie, A. W. T. Bean, G. Berkley, jun., P. W. Britton, C. W. Bryden, G. S. Campbell, A. B. Holmes, A W. Itter, A Pine, J. N. Taylor, A. B. Todd, J. H. F. Townsend, T. Tully, and L H. Whitmore as associate members; and Lieut. H. E. M'Callum as an associate.

MARCH 9TH.—Mr. W. H. Barlow, president, in the chair. The paper read was "On the Purification of Gas," by Mr. H. E. Jones,

MARCH 23RD.—Mr. W. H. Barlow, F.R.S., president, in the chair. The paper read was "On Explosive Agents applied to Industrial Purposes," by Prof. Abel.

QUEKETT MICROSCOPICAL.

FEB. 27TH.—Dr. T. S. Cobbold, president, in the chair. Five new members were elected. A paper "On Bleaching and Washing Microscopical Sections," by Mr. S. Marsh, was read by the secretary. Mr Gilbert pointed out some of the disadvantages which attended bleaching, and Dr. Matthews recommended the increased use of polarised light as a means for the differentiation of tissues. The president read a paper entitled "Observations on Human Filariæ," in which he gave an account of a remarkable series of investigations conducted by Dr. Manson in China, and by other medical gentlemen in that country and in India, which tended to show that in persons afflicted by these parasites the blood was comparatively free from them during the day, but swarmed with them at night, especially during those hours when mosquitoes bit most freely. The life history of the Filaria during its five days' development in the body of the mosquito was described and illustrated by numerous diagrams and specimens. An improved form of turntable was exhibited and described by Mr. Dunning.

ANTHROPOLOGICAL INSTITUTE.

FEB. 24TH.—E. B. Tylor, Esq., president, in the chair. Mr. J. H. Gladstone was elected a member. Dr. Tylor read a paper "On the Origin of the Plough and the Wheeled Carriage." The first agricultural implement seems to have been a pointed stick four or five feet long, such as many savage tribes still carry for the purpose of digging roots, knocking down fruits, and unearthing animals; at a later date the stick was bent and used hoe fashion, the point being hardened by fire. The Indians of North America still use it in this fashion. In South Sweden large tracts of land give evidence of early culture, which is attributed by the natives to a prehistoric people, called by them "the hackers," whose rude hoe was a fir pole with a short projecting branch pointed, and who are always associated with the giants of mythology. There came into use afterwards a larger instrument of the same kind, which was not used like the hoe, but was dragged by men or oxen. Instances of this are to be found in the old Egyptian pictures and among the bas-reliefs, and it is evidently the primitive idea of the plough. The plough in its origin is prehistoric, evidences of its early use being found amongst the Greeks, Egyptians, and Chinese, and it had from the earliest times a religious sanction, one proof of which is found in the fact that the name of Brahma's wife, Lita, signifies a furrow. A wooden hook shod with iron was the next improvement, and in the time of Virgil we find a wheeled plough in use which differed little from the best in Europe a century ago. Some people assert that the plough was the earliest vehicle, but it seems more probable that the sled was first used, next rollers were placed underneath and shifted forward when necessary, as seen in one of Raphael's pictures in the Vatican, and then the middle part of the rollers was shaved away in order to reduce the friction. In some carts of the Scythians the solid drum wheel is fixed to the axle, so that wheel and axle revolve together; and in Italy and Portugal at the present day the carts are very generally built with large block drum wheels, and in many cases the bearings are not locked below, but merely rest on the axle, like forks. The original mode of harnessing was the yoke, attached to the horns or withers of oxen In the time of Homer no traces were used; but the Egyptians used one trace, which shows that they were one stage further advanced in civilisation. The Gauls and Britons evidence a still greater advance in the employment of chariots, some even furnished with scythes, like those mentioned in Maccabees. Dr. Dally exhibited a fine collection of ethnological objects from British Columbia. On some of the hats which were shown Dr. Dally pointed out marks similar to the tattoo marks with which the natives adorn their bodies, and which, he said, all have a definite meaning, being in fact a record of events which have taken place in the life of the wearer Some of the specimens of native workmanship were remarkably good, particularly some silver bracelets, which had been made and engraved specially for Dr. Dally. The natives appear to have a knowledge of working iron and brass as well as the softer metals.

MARCH 9TH.—F. Galton, Esq., V.P., in the chair. Mr. G. Morrison was elected a member. Mr. F. Galton described the curious psychological fact on which he wrote a preliminary memoir in *Nature* on January 15th. He found that about one in every thirty adult males or fifteen females not only see numerals in a vivid mental picture whenever they think of them, but that each number is always seen in the same definite position in their mental field of view. Consequently, when they think of a series of numerals, 1, 2, 3, 4, 5, 6, &c., they are always mentally seen as if ranged in a regular pattern or form. These forms are invariable in the same individual; they date, in all cases, further back than recollection extends, they are very vivid, and quite independent of the will. They are of fantastic shapes, but no clue can be suggested as to their precise origin; they differ extremely in different people. Mr. Galton exhibited a collection of nearly sixty of these forms, furnished to him by friends and correspondents, whose descriptions of their general characters were curiously consistent and corroborated one another. All this is difficult to understand by the great majority of persons who cannot visualize, but these should never assume that others cannot have a mental habit in which they themselves are deficient. Several of Mr. Galton's correspondents testified to their respective forms, viz., Mr. G. Bidder, the Rev. G. Henslow, Mr. Schuster, Mr. Roget, Mr. B. Woodd Smith, and Colonel Yule. Mr. Henslow and Mr. Schuster saw their forms objectively, and could point to the direction and specify the apparent distance at which they saw them, but they appeared to the other gentlemen, as it were, in dreamland, without relation to external space. Mr. Galton showed that these forms were survivals of the mental processes of the child before the time when he could read, and connected their lines with those that govern handwriting and gesture, architecture of animals, and their characteristic movements. He also showed how marked were the traces of the mental conflict in the child between the verbal and visual system of arithmetic between ten and twenty. What the ear perceives as "ten," "eleven," &c., the eye reads as "one-nought," "one-one," &c. Accordingly the forms twist and bend at the tens and twelves, and are further modified at the "teens." He thought from trials on his own mind that this conflict existed throughout life, and believed that our barbarous nomenclature was a serious bar to the ready acceptance of a decimal system of weights and measures. This habit of seeing numerals in forms is strongly hereditary. Mr. Gill exhibited a number of photographs of Australian aborigines.

Mar. 23rd —E B. Tylor, Esq., President, in the chair. A paper by Mr. V. Ball, 'On Nicoberese Ideographs,' was read. As the Adamanese may be said to have not progressed in civilization beyond that stage which was represented by the people of the early stone periods in Europe, so the Nicobarese, who are much less savage and degraded than their neighbours of the Andamans, may justly be compared with the inhabitants of the bronze period. The example of Nicobarese picture writing described by the author was obtained in the year 1873, on the island of Kondul, where it was hanging in the house of a man who was said to have died a short time previously. It is now in the Museum of Science and Art at Dublin. The material of which it is made is either the glume of a bamboo or the spahte of a palm, which has been flattened out and framed with split bamboos. It is about three feet long by eighteen inches broad. The objects are painted with vermillion, their outlines being surrounded with punctures, which allow the light to pass through. Suspended from the frame are some cocoa-nuts and fragments of hog's flesh. The figures, of the sun, moon, and stars occupy prominent positions.—Attention was directed to M. Maclay's description of a Papuan ideograph, which symbolized the various guests present at a feast given in celebration of the launch of two large canoes (*vide Nature*, vol. xxi. p. 227.)—Mr. A. Tylor read a paper 'On a New Method of expressing the Law of Specific Changes and Typical Differences of Species and Genera in the Organic World, and especially the Cause of the particular Form of Man.' The lower animals have no abstract ideas, and therefore all they can know must be derived from objects. Their reproduction of specific form and decoration seems to prove that they possess a mental power of appreciating the niceties of form and colour in a very high degree. The forms and decorations of organized beings seem to be regulated by laws which the author provisionally called emphasis and symmetry. Emphasis was defined as the marking out by form or decoration of the important parts or organs. It is a remarkable fact, and one that can scarcely be accidental, that just as animals fall naturally into two great classes, the vertebrata and invertebrata, so the emphasized functional decorations group themselves into two classes, and these two classes are identical with the vertebrata and the invertebrata. In the vertebrata the emphasized ornamentation is what we may call axial, being the outward expression of the central axis or vertebral column with its appendages; and in the invertebrata the decoration tends to follow the outline of the animal and so developes borders. It has always excited wonder that the child—a separate individual—should inherit and reproduce the characters of its parents, and indeed of its ancestors; but if we remember that the great law of all living matter is that the child is *not* a separate individual, but a part of the living body of the parent up to a certain date, when it assumes a separate existence, then we can comprehend how living beings inherit ancestral characters, for they are parts of one continuous series, in which not a single break has existed or can ever take place. Mr. Tylor's paper was illustrated by a large number of diagrams.

MICROSCOPICAL SOCIETY.

March 10th.—Dr. Beale, President, in the chair. Fifteen gentlemen were nominated or elected Fellows. Mr. Beck exhibited an improved form of microscope with swinging substage, Mr. Mayall a new traverse lens by Mr. Tolles, Mr. Dunning a new form of turntable, Dr. H. Gibbes a one-twelfth homogeneous immersion objective, for use with the binocular, and Mr. Crisp Klonne & Müller's demonstration microscope and a specimen of micrometric ruling by Prof Rogers, of Harvard, U.S.—Mr. J. Smith described his method of illumination for high powers.—The following papers were read: On a Sponge Parasitic within *Carpenteria raphidodendron*,' by Prof M. Duncan, 'On a Petrographical Microscope,' by M. Nachets, 'On Double and Treble Staining of Animal Tissues,' by Dr. H. Gibbes, and 'On *Podophyra quadripartita*,' by Mr. Badcock.

PHYSICAL SOCIETY.

Feb. 28th.—Prof. W. G. Adams in the chair. Mr. Ridout read a paper "On some Effects of the Vibratory Motion in Fluids," and a paper "On the Pneumatic Experiment of M. Clement Desormes." Dr C. W. Wright read an exhaustive paper "On the Determination of Chemical Affinity in Terms of Electromotive Force."

CHEMICAL SOCIETY.

March 30th. — Anniversary Meeting.—Mr. Warren De La Rue, President, in the chair. The President in his annual address contrasted the condition of the Society during the past year with its position in 1869. The number of Fellows has increased from 522 to 1,034; the income from £1,100 to £2,700; the papers read from thirty-one to seventy-five. A rapid glance was then taken at the recent progress of chemistry, especial reference being made to the decomposition of the elements chlorine, bromine, &c., by Meyer; the photographs of the whole of the spectrum recently made by Capt. Abney; the artificial production of the diamond by Hannay; the synthesis of vegetable colouring matters and alkaloids; the discovery of a new element, Scandium, &c. The officers for the ensuing year were then balloted for. The President elected was Prof. Roscoe; and the Secretaries, Mr. W. H. Perkin and Mr. H. E. Armstrong.

Mr. James A. Stout, of Belleville, Ill., has patented a traction engine in which the propelling power is applied directly to an adjustable front axle, and the axle is provided with a universal or ball joint motion. The boiler is of novel construction, and designed with a view to economy and safety.

An improved rock drill, patented by Mr. John Brown, of Ishpeming, Mich., is so constructed that the piston and tool may be rotated by the entering air or steam, and that the entrance and exit of the air or steam will be controlled by the movements of the piston.

EXPLOSIVE AGENTS APPLIED TO INDUSTRIAL PURPOSES.

By Prof. Abel, C.B., F.R.S., Assoc. Inst. C.E., &c.

In this paper, which was read at a recent meeting of the Institution of Civil Engineers, the president, Mr. W. H. Barlow, F.R.S. (a Council Member of the Inventors' Institute), being in the chair, the author pointed out that since this subject had been brought by him before the institution in 1872 the advantages of explosives more violent in character than gunpowder for many important industrial uses had become so widely known and extensively utilised that the supremacy of gunpowder, as the only practically useful and economical blasting agent, had for some time been a thing of the past. The greatly superior results furnished by dynamite, gun-cotton, and other explosive agents of the same class, when applied to work in which their rending and shattering action was valuable, had led to the replacement of powder by them in many directions It had also had the effect of rendering miners more critical in regard to the quality of blasting powder, a result which had operated beneficially, not only by requiring the bestowal of greater care upon the manufacture of blasting powder, but also by leading to improvements in the nature and form of powder An improved blasting powder of Messrs. Curtis and Harvey was referred to as one illustration of this. An account was given of the advantages attending the employment of compressed powder, in the form of the charges first devised by Messrs. Davey and Watson, and manufactured by Messrs. John Hall and Son, which were rapidly coming into extensive use, and which presented unquestionable advantages over granular powder on the score of convenience and comparative safety as well as of greater efficiency. Other improvements in the application of gunpowder having been referred to, the author proceeded to examine into the progress which had been made in the production and application of preparations of gun-cotton and nitro-glycerine, observing that but few of the many proposed substitutes for gunpowder, to which he had alluded in 1872, had received any important applications.

The advantages attending the employment of wet gun-cotton were described, and the manner in which its detonation was brought about was examined; the theory of the development of detonation, as distinguished from explosion, and of its transmission, being incidentally discussed. Various important technical applications of wet gun-cotton, dynamite, &c, were referred to as illustrating the utilisation of the comparatively instantaneous character of detonation. It was pointed out that the safety, power, and comparative simplicity attending the application of wet gun-cotton to the larger operations for which violent explosives were valuable, had led to its adoption for submarine mines, torpedoes, and military engineering operations generally. On the other hand, compressed gun-cotton, employed either wet or dry, was now only used to a limited extent as a blasting agent, chiefly in the form of preparations sold under names by which their actual nature was disguised. Thus a variety of nitrated gun-cotton, converted into compressed charges similar to the original compressed pure and nitrated gun-cotton, was supplied to the miner under the name of tonite, and its employment as an efficient blasting agent was gradually extending. An account was given of the rapid progress which had been made in the application of the nitro-glycerine and Kieselguhr mixture, called dynamite, to the exclusion of other plastic nitro-glycerine preparations. The employment of dynamite upon a large scale was illustrated by reference to the stupendous operations connected with the destruction of the reef at Hell Gate in East River, New York, when a total of 49,915 lbs. of dynamite and other nitro-glycerine preparations was exploded in one single operation. The objections to the employment of nitro-glycerine in the pure liquid state were pointed out. Reference was made to the tendency of dynamite to freeze, and the necessity for thawing it before use, as a prolific source of fatal accidents in connexion with mines and quarries, owing chiefly to recklessness of the men and their disregard of caution and instructions. In the course of the paper the author referred repeatedly, and in strong terms, to the mischievous and frequently disastrous effects of misleading statements with respect to the safety of particular explosive agents, such as the absence of noxious gases in connexion with their use, &c, which had from time to time been published and circulated in mining districts by the manufacturers and vendors, and which not only engendered false ideas of safety, but also encouraged the natural tendency to disregard precautions.

An account was next given of a new class of nitro-glycerine preparations, devised by Nobel, of which the so-called blasting gelatine was the type, and which presented such decided advantages over dynamite in several directions that they had already, to an important extent, supplanted it on the Continent, and promised to extend greatly the safe and efficient application of nitro-glycerine. In giving an account of the properties of blasting gelatine, and of certain difficulties which had to be overcome in its application, the author described a series of experiments he had made with the view of increasing the relative power, &c., of the more important explosive agents. Reference was also made to useful practical results which attended investigations on the transmission of detonation to considerable distances. The paper concluded with a review of the beneficial results in connexion with the manufacture, transport, storage, and use of explosive agents which had attended the judicious application of the measures included in the Explosives Act of 1875, and with these comments, on the one hand, on the necessity for increased activity on the part of local authorities in some directions in connection with the Act, and, on the other hand, on the danger to the public and to commercial interests, resulting from the persistent refusal of railway authorities to facilitate the legitimate transport of explosives.

INVENTORS' INSTITUTE.

THE following is the detailed description, extracted from the specification of the patent of Mr. Turnbull's invention, which was brought before the Inventors' Institute at the meeting, 8th April, 1880 —

These improvements in steam engines, surface condensers, and valves are as follows:— To improve the construction and increase the economy of steam engines I dispense with crosshead connecting-rod, &c., and connect the piston and crank together by each end of the piston rod through a movable stuffing-box, which is fitted to or cast on a plate that moves steam tight on the surface of the cylinder cover, which is made convex, and has an oblong opening to suit the oscillation of the piston-rod caused by the motion of the crank. The pressure and friction produced by the angular thrust of the piston-rod is counteracted by admitting steam between the piston and cylinder on the side where the pressure is by a small self-acting valve fitted into the piston. By this improvement the number of parts and friction is greatly reduced.

The second part of my improvements is to increase the economy of steam in compound engines with two or more cylinders. The exhaust steam of each cylinder passes to the condenser or atmosphere according to the type of engine. When two cylinders are used the cranks are fixed from 90 to 120 degrees apart, and when three cylinders are used the cranks are fixed from 100 to 120 degrees apart. The steam from the boiler is supplied to the small cylinder through suitable steam passages and valves, which are worked from a separate link motion which regulates the steam required for the engine. When the piston of the small cylinder has performed part of the stroke the steam is transmitted from the pressure side of the piston by an intermediate valve or valves into the steam chest of the large cylinder or cylinders. The intermediate and steam valve work in unison at full, though from separate, link motions, and are connected to the same reversing shaft. In starting the engine all the valves can be worked from the same reversing lever when sufficient steam has been transmitted to the large cylinder or cylinders, the steam valve recloses, and the intermediate valve or valves opens the communication between the small cylinder and condenser.

The third part of my improvements in steam engines is to increase the expansion of the steam in engines fitted with link motions by regulating the opening of the expansion valves from the lever on the reversing shaft, that suspends and varies the position of the link, or from a lever specially fixed on the reversing or intermediate shaft, as may be most convenient, or the expansion of the steam is increased. In engines fitted with link motions by working an exhaust valve within the steam valve from the valve spindle of the same, which has a screw cut on it of suitable pitch to cause it to rotate and move the exhaust valve alternately to each end of the steam valve, by which the steam is maintained on the propelling side of the piston longer than in engines worked by the ordinary valve and link motions, it likewise greatly reduces the excessive compression of the steam on the exhaust side of the piston in engines working at a high grade of expansion

The fourth part of my improvements is for the continuous cooling of the water for condensing the exhaust steam in locomotive and other engines by forcing the water into spray by an ejector in a tank or tender through which the air passes. Instead of distributing the water over a series of tubes, as in my patent of Aug. [illegible]5, 1877 (No. 3112), I distribute it in a tank without tubes, through which the air passes, and the vapour that arises from the water I condense in another part of the tank fitted with tubes, or in a separate vessel with tubes: the exhaust steam is drawn by the ejector into contact with the condensing water. To prevent any evaporation, I place an absorbent material over the opening to the atmosphere, part of the condensing water is returned to the boiler. In other engines the air is forced or drawn by a blowing or exhausting fan through the tubes Or I convey the exhaust steam by an ejector into contact with the condensing water, which is forced into spray over tubes, fitted water-tight in a tank through which the air passes. The air and feed water is treated as before described. I likewise condense the exhaust steam in locomotive and other engines by exhausting it among a series of tubes, made steam-tight in the tank or tender through which the air passes. The vapour and water from the condensed steam I remove by an air pump, and return the condensed water to the boiler. In stationary engines the air is forced or drawn through the tubes of the condenser by a blower or exhausting fan. By these improvements a vacuum is formed which greatly increases the effective power and economy of the steam.

1. I claim the method of directly coupling the crank and piston together by each end of the piston rod as described.

2. I claim the intermediate valve in the steam chest for transmitting the steam from the small cylinder to the large cylinder, or cylinders, which likewise discharges the exhaust steam from the small cylinder to the condenser.

3. I claim the self-acting valve in the piston for neutralising the angular thrust of the piston-rod against the side of the cylinder.

4. I claim the use of the packing pieces between the piston rings.

5. I claim the method of varying the expansion valves for regulating the amount of steam required in the engines from an arm on the reversing or immediate shaft as described.

6. I claim in engines fitted with link motions an exhaust valve within the steam valve worked from the spindle of the same, for increasing the expansion of the steam.

7 I claim the various methods described for cooling the water and condensing the exhaust steam in locomotive and other engines.

USE OF ASPHALT AND MINERAL BITUMEN IN ENGINEERING WORKS.

By W. H. DELANO, Assoc. Inst. C.E.

UNDER the above title a paper was read at a recent meeting of the Institution of Civil Engineers, Mr Brunlees (vice-president) in the chair, the official abstract being this:—

Adopting the nomenclature of M Léon Malo, which had received general sanction, the author considered asphalt as a combination of carbonate of lime and mineral bitumen produced by natural agency. Asphaltic mastic was the rock ground to powder, and mixed with a certain proportion of bitumen. Gritted asphalt mastic was asphalt mastic to which clean sharp sand had been added. Asphaltic or bituminous concrete was gritted asphalt mastic, mixed when hot with dry flint or other stone. Boussingault's analysis of bitumen gave C_{85},H_{12},O_3. It was, therefore, an oxygenated hydro-carburet, and quite distinct from the preparations of gas tar and pitch, which were sometimes erroneously styled bitumens and asphalts. It was important that these distinctions should be borne in mind when specifying asphalt, as their disregard might lead to the employment of a material having few of the properties of the natural rock, although bearing to the uninitiated a strong resemblance thereto. Messrs. Hervé-Mangon and Durand-Claye, of the Ecole des Ponts et Chaussées, Paris, had supplied the author with detailed analyses of different kinds of natural asphalts, which were given in the paper, and specimens were exhibited. But beyond knowing the numerical value of the proportionate constituents, it was highly necessary that the engineer should be acquainted with their quality. Asphalts which gave almost identical analyses might in practice yield widely different results, if the nature of the individual components was dissimilar. Powdered limestone should be white and soft to the touch; if rough, it probably contained iron pyrites, silicates, crystals, &c. The presence of these substances was prejudicial, and if suspected the limestone should be subjected to a secondary analysis, directions for which were given. The proportion of bitumen to limestone in the natural asphalt should not exceed 10 per cent. for carriage ways, indeed less than that was preferable. For this latter purpose no asphalt should be specified which had not stood the test of, at least, three hot summers and three cold winters. These precautions being taken, the author was of opinion that a well-laid surface of compressed asphalt, 2 to 2⅝ inches thick, on a foundation of Portland cement concrete, 6 to 9 inches thick, was superior to all other carriage-ways. It was noiseless; hygienic, being impervious to urine and the liquids from dung; absorbed vibration; produced neither dust nor mud; was cheap, durable, and easily repaired, and the old materials could be used again. The charge of slipperiness, which had been made against asphalt roadways in London, was not due to the material but to the absence of provisions for proper scavenging. In Paris, where the asphalt was regularly scraped, washed, and swept, the complaint did not arise. In support of the assertion that climate did not affect the asphalt in London, a table of humidity was given showing the means of six years (1873-8) observations to be—for Paris, 80·2; for London, 81·5. The cost of washing the roadways, when done systematically and on a large scale, was much less than was generally supposed, and the advantages far more than counterbalanced the expense. The author submitted a design for a portable washing and sweeping machine for use in London. Reference was made to the cost of compressed asphalt carriage-ways. In Paris this amounted on the average to about 13s. per square yard on lime concrete 4 inches thick, but a thickness of 6 to 9 inches of Portland cement concrete was much preferable. The cost of transport of the material also exercised an important influence on the ultimate expense. Details were given of various works of asphalt paving carried out by the author, with particulars of the cost of maintenance.

The quality of absorbing vibration, which was a marked characteristic of asphalt roadways, had been taken advantage of in the application of the material for the foundations of machinery running at high speeds. This was instanced in the case of a Carr's disintegrator, which, being mounted in a pit lined with bituminous concrete, was worked at 500 revolutions per minute without sensible tremor, whereas with the former wooden mountings on an ordinary concrete base the vibration was excessive, and extended over a radius of 25 yards. In the Paris Exhibition of 1878 there was shown a block of bituminous concrete, weighing 45 tons, forming the foundation of a Carr's disintegrator used as a flour-mill, and making 1,400 revolutions a minute, a speed which would have been impracticable on an ordinary foundation. Extensive applications of the material for this purpose obtained in France, especially in connection with steam-engines and steam-hammers.

Another use of asphalt was for the flooring of powder-magazines, where its non-spark-emitting character made it particularly valuable. It was also largely applied in France in the form of gritted mastic for the flooring of casemates in fortifications, and in its pure liquid form for the coating of vaults and arches, where it protected the masonry from damp, and the subsequent disintegration caused by infiltration and by frost.

In conclusion, the author referred to the imitation asphalts occasionally brought forward, and by some regarded with favour on the score of cheapness. The best of these, if properly made, was as dear as the natural material, without in any degree possessing its special qualities of appearance and durability; and in no case were any of them suited as paving materials to resist heavy traffic. In Paris the tricks of irresponsible paving contractors were many, and necessitated constant vigilance. Inferior cement was put into casks bearing established brands, and the concrete made with such cement was put down in thinner layers than was paid for. The author had even known cases where the concrete was omitted altogether, a layer of common mortar taking its place. Such foundations would ensure the failure of the best asphalt, which ought to be considered only as a wearing surface or armour to the concrete. But the mode most difficult of detection was the ostentatious display at the site of the works of cakes of the particular asphalt specified, while an inferior material was in the boilers. Once laid wear alone would reveal what had taken place. From these malpractices asphalt had occasionally suffered unmerited condemnation, but the author claimed that with *bona fide* materials and workmanship satisfactory results could always be obtained.

A NEW GAS ECONOMIZER.

THIS novel device for enriching and economising coal gas is simple and easily applied, and is said to be very efficient. On the top of the liquid-tight vessel there is a dome, from the centre of which a glass tube projects. This tube is closed at the top, and at the bottom opens into the vessel. A float, having a cork bottom, slides upon a tube which enters the vessel at the bottom, and communicates with a pipe leading from the gas meter. In the upper portion of the float there is a shallow chamber which communicates by small perforations with small vertical tubes arranged around the float. From the top of the float a needle extends upward into the glass tube, and serves as an index of the movements of the float. The vessel is provided with a filling tube, through which some of the lighter hydrocarbons are introduced into the vessel. The float rises and falls freely as the depth of the liquid varies in the vessel, but the weight of the float remaining the same its displacement is not affected by the quantity of liquid in the vessel, and the gas ejected into it from the float will always have the same quantity of liquid to rise through, thereby insuring uniformity in both the pressure and the quantity of gas supplied. Gas conveyed to the float through the tube passes into the vertical tubes and rises up through the liquid, and finally passes out through the tube for distribution to the burners.

The gas is enriched by its passage through the hydrocarbon, and the light given by it is correspondingly increased.

This useful invention, the *Scientific American* states, was recently patented by Mr George T. Strong, of Port Hope, Ontario, Canada, from whom further information may be obtained.

HYDROCELLULOSE IN PHOTOGRAPHY.

M. AIME GIRARD has communicated to the Photographic Society of France the following note on the employment of hydrocellulose in preparing photographic pyroxyline:—"Whenever cellulose ($C_{12}H_{10}O_{10}$), in any form, is submitted to the action of concentrated acids, it is dissolved, and by taking up two equivalents of water is transformed into glucose ($C_{12}H_{12}O_{12}$). But previous to this saccharification, an intermediate stage may be observed, where only one equivalent of water is taken up, and a new compound is formed to which the formula $C_{12}H_{11}O_{11}$ is attributed. This compound, to which I have given the name of *hydrocellulose*, is not soluble in the acids, and provided that care be taken in the manipulation, it still possesses its original external form, but so soon as it is touched it will be found to have lost all its power of cohesion, and to fall away to an almost impalpable powder. Hydrocellulose possesses a number of chemical properties of its own, but it keeps also some of the properties belonging to ordinary cellulose. Among the latter is its capability of being nitrified by a mixture of nitric and sulphuric acids, and of being by this means transformed into either explosive or soluble pyroxyline. In this way we can prepare either explosive or soluble pyroxyline in the state of a fine powder. The manner of preparing it is precisely similar to that of preparing pyroxyline from cellulose, but in this case the product, when rubbed in a mortar, is at once reduced to an exceedingly fine powder. This powder, dissolved in a mixture of alcohol and ether, gives a collodion whose value to photographers it will be most interesting to ascertain.

The only difficulty, therefore, is the production of the hydrocellulose. This substance can be obtained from any form of cellulose, but the best for the purpose will be found to be raw cotton in tufts. For effecting the conversion there are three ways:—(1) Immersion for several hours in concentrated acids; (2) exposure to the vapours of the hydracids, as hydrochloric or hydrofluoric acid, (3) absorption by a weak acid, and then desiccation. Of these three methods the last-named is undoubtedly the most convenient. Take, then, some fine tufted cotton, and immerse it in a 3 per cent solution of nitric acid; remove it immediately, drain it, and put it in a cloth and wring it well; then pull it out and leave it to dry. If you are pressed for time you may dry it on a stove at a temperature of 40 deg. to 50 deg.; a few hours will in that case suffice to render the cotton quite friable, and its transformation into hydrocellulose will be complete. But care must be taken not to raise the temperature above the point indicated, or the substance will turn yellow and decompose. When, however, time is no object, let the cotton be well pulled asunder, and then be allowed to dry slowly on a plate in the laboratory or studio at a temperature of from 15 deg. to 20 deg. By this, the more preferable method, the cotton will, in a few weeks be converted into hydrocellulose, which, though perfectly friable, will preserve sufficiently its fibrous condition to be easily acted on by the acids that are to nitrify it.

MILK A FORBIDDEN FOOD IN CHINA.

THE Chinese, who esteem rats to be a delicacy, are down on the use of milk. The following translation of a Chinese placard regarding the highly immoral practice of consuming cow's milk is sent to the *Foochow Herald* for publication:—"Strictly refrain from eating cow's milk! Man should not rob the beasts of their food. Moreover of all beasts the cow is the most useful and meritorious. Men who do not discriminate between mankind and beasts are worse than senseless. Those who sell milk darken their consciences for gain, and those who eat cow's milk foolishly think they are benefiting their bodies. Men who take medicine should first carefully investigate and find out its nature. Why do not those who eat cow's milk consider and inquire into its origin? For instance, men beget children, and while the children are small they depend upon milk for their nourishment; so it is also with beasts. But when men buy milk to eat, do they not do injury to the life of the calf? And is there not bitter hatred and distress in the minds of both cow and calf? Beasts cannot speak; how then are they able to tell the man that, in eating the milk of beasts, his body becomes like that of birds and beasts? But if men wish to take strengthening medicine there are numberless other articles in the world that are beneficial; and what necessity then is there for taking cow's milk? Besides this, the death and life of men have their fixed number and limit, and this cow's milk cannot lengthen out and continue the life of man. Since, then, all know the truth—that it cannot do this, all ought to act with loving and benevolent spirit. Especially all who receive this exhortation should keep from eating milk. The children of those who cause their families to refrain from eating milk will be preserved to grow up; they also will thus lengthen out their own lives, and will escape from evil in time of fatal epidemics. If such persons be able also to exhort others, who are ignorant of first principles, to leave off the eating of milk, their descendants shall surely prosper. Published by the Hall of Good Exhortations. The Xylographic blocks are deposited in the Ung Ling Koh."

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Grain and Seeds (Treating, &c)—W. R. Lake (com), J. H Johnson (com.), E. Edwards (com.).

Greenhouses, Hothouses, Conservatories, Forcing Pits, and Frames.—E. G Brewer (com).

Grinding and Crushing Corn, Grain and Seeds, and Dressing Flour.—A W. L. Reddie (com.). H. J Haddan (com.), W. Clark (com.).

Grinding, Crushing, Pulverising, and Disintegrating Miscellaneous Substances.—S. Marshall.

Harbours, Piers, &c.—W. L Rutton.

Harness, Saddles, Curbs, Whips, Releasing from Harness, Grooming Horses, Nosebags.—W. Jenkinson and J. F. Mayman, E. Paquis, E Kimber (com.), H. A. Bonneville (com.), S. Staight.

Hats, &c.—E. Edmonds (com.), W. R. Lake (com.).

Heating, Warming, &c.—W. R. Lake (com.), B. J. B. Mills (com.), J. M. Dassy, F. H. F. Engel (com.), A. K. Irvine, T. R. Johnston, H. J. Haddan (com.).

Hinges, &c.—W. Cowell and W. W. Chapman, E. I. Billing.

Hoists, Cranes, Capstans, Windlasses, Raising, Lowering and Moving Heavy Bodies, Raising from Mines.—E. Edwards (com.), R. Bamforth, A. W. Hay, A. West, J. E. Richard, J. H. Johnson (com.), W R. Lake (com.).

Hops.—A. J. Reynolds.

Horse Shoes, Shoeing Horses, Shoes for Animals, &c.—W. R. Lake (com), S. Pitt (com.).

Injectors, Ejectors.—J. A. and J. Hopkinson.

Insulating, &c.—J. R. Edwards, G. Wells and A. Gilbert.

Iron (salt and oxides).—F. Braby.

Keys, Cotters, &c.—S. and L Wilson.

Knitting, Tatting, Crocheting, &c.—W. R. Lake (com).

Knives, Forks, Table Cutlery, Knife Cleaners. -E. M. Knight, J. Cherk, S. Staight.

Knobs.—A. and R F. Heath.

Lace.—L. O. Deschamps.

Ladders. -J. E. Richard, H. J. Allison (com.).

Lamps, Lanterns, Chandeliers, Candlesticks, Lamp Furniture, Glasses and Shades, Lighting, Producing Light.—M. Marichenski, C. T. Brock, J. A. Dryden, H. B. Fox, J. Shepherd, J. J. F. Stevens, O. Sweeney, J. L. Sampson, A. Howat, J. T. Dann, J. Thomas

Leather, Skins, Hides, Artificial Leather and Parchment, Currying, Tanning, Cutting, and Ornamenting Leather.—B. and D Wright, A. M. Clark (com), W. R. Lake (com).

Life-buoys, Life Preservers, Rafts, Life-boats. —W. R Lake (com)

Locks, Latches, Bolts, Lock Furniture. Keys — J Kaye, G. Andrews, J. C. Callot, J M. Hart, J. Gaskell and R. T Grocott, P Loring.

Manure, Treating Sewage.—F. Breyer, G. H Garson, H. H. Lake (com.).

Maps, &c —J. Bell

Mathematical Instruments.—H. Johnson, H. V. White, F Wirth (com.), J. Hepple.

Medicines, Drugs, &c.—J. C. Grinsell, T. Morgan (com.).

Metals (annealing, &c.). - W. Scholes.

Metals (Casting, &c)—T Nordenfelt, H. T. Grainger.

Metals, Cutting, Planing, &c.—T. Naish

Metals (Forging, &c)—A M. Clark (com.), N. Thompson, S Pitt (com.), L E. Gachelin, R. H. Tweddell, J. Windle, W. A. Barlow (com.), W. A Barlow (com.), J. P. Burns, E. I. H. E. and J. T Whitehouse.

Metals (Plating and Coating, &c.)—L. A. Davies, F Braby, P. Jensen (com.). L. Howell, R. Moss, I N Switzer.

Metals (Smelting, Extracting and Reducing Metals, Heating Ores, Refining, Tempering, and Annealing Metals, Manufacture of Iron and Steel, Metallic Alloys, &c.)—S A. Peto, J. Haldeman, W. R Lake (com.), R. Lancaster, J. Windle, P. M Justice (com.)

Meters, Measuring Liquids and Fluids, &c.—E. Hunt, J. MacFarlane.

Mining, Boring and Blasting Rock, Raising from Mines, Getting Coals, Draining, Lighting, and Ventilating Mines.—H. Johnson, H. Rider, A West.

Mixing, Kneading, Mashing, Stirring, Agitating, &c.—G. M. Allender.

Motive-power Machines, Obtaining Motive power —E. Hunt, J. H. Johnson (com.), J. McPherson

Musical Instruments, Music. &c. — W. A. Waddington, H. Wilton, G. W. von Nawrocki (com.), C. Gley and E. Lander.

Nails, Spikes, Bolts, Rivets, Screws, &c.—A M. Clark (com.), S. Pitt (com.).

Nuts and Washers.—N. Thompson, J. P. Binns.

Oiling or Lubricating, &c. — G. W. von Nawrocki (com), J. T. King (com.), S. Tweedale, J. A. and J Hopkinson.

Oils, Fatty Matters, Grease. —M. Gandy and C. S. Brittain, R. P. Thacker. A. T. Angell, M. I. Emanuel, J. Broad, J. Hardman, G. Wishin, W. Smith.

Ornamenting, &c.—A. Martyn, R. McCaw J. Stevenson and J. P. Orr, S. Bowden.

Ovens and Kilns.—G. and H. Lobes (com.), E. A. Bourry.

Oxidation and Incrustation (Preventing and Removing).—C. Pieper (com.), H. P. Scott and T. D. Donaldson, P. Jensen (com.).

Packing Pistons, &c.—R. L. Barker, J. G. Hey, E. A. Bourry.

Packing, Storing, Baling, &c.—G. C. Wallich, A. W. Hay, E. A. Billing.

Paints, &c.—E. Wright.

Paper, Pasteboard, Papier Mache · Paper Hangings.—J. C. W. Stanley, A. Siebert, A. McCaw, J. Stevenson and J. P. Orr, R. C. Menzies and C. J. Levan, F. H. F. Engel (com.).

Pasting.—A. M. Clark (com.).

Pens, Pencils, &c.—J. Illfelder.

Photography and Photographic Apparatus, Pictures Portraits, &c.—G. C. Bell.

Pictures, Portraits, &c.—A. Martyn, H. Johnson, W R. Lake (com.), J Bell.

Pipes, Tubes, and Syphons: Joining Pipes.—J. Whitehead, C Palmer, G. Sonnenthal, B J. B. Mills (com.), W. E. Gedge (com.), J. H. Radcliffe, J. Snape and J. A. Noel, E. A. Bourry, W. R. Maguire, T. Jowell, H. Doulton.

Pistons, &c.—R. Barker.

Preserving and Preparing Articles of Food.—B J. B Mills (com), J Wickersheimer.

Presses, Compressing, &c.—M. Stonehouse, M. Gandy and C. S. Brittain, R. P. Thacker, P. M. Justice, J. S. Simmons, W A. Barlow (com.).

Printing and Transferring Type and other Surfaces for Printing, Composing, and Distributing Type.—W. Morgan-Brown (com.), J. J. Emery, J. H Johnson (com.), F. H. F Engel (com.), A. Siebert, C. H. Nevill, J. J. Sachs, J. J Raggett, J Shead, J. Sachs, C. Beckmann (com), M. M. Bebroe, A. Sauvee, G. Harrison.

Propelling Machinery, Transmitting Power, and Motion, Converting Movements.—N. D. Spartali, M Stonehouse, W. B Dewhurst and G. Barker, L. Wilson, H. J Haddan (com.)

Propelling Ships, Propellers, Paddle-wheels and Screws.—J. H. Thomas, J. and J Pfannkuche, J. Bohanna.

Pumps, Pumping and Raising Water and other Liquids Pumps, Pistons, and Packing.—E Hunt, P. Dean, C. Pieper (com.), W B. Dewhirst and G. Barker, J. L. Anderson, M. Merichenski.

Punching or Perforating.—W. A. Barlow (com.).

Railway and other Buffers.—G Turton.

Railway, Permanent Way, Rail Joints, Chairs and Sleepers, Portable Railways, Atmospheric Railways, Switches, Points, Crossings, and Turn-tables.—A. M. Clark (com.), W. Morgan-Brown (com.), J. W. Hartley and C. M. Campbell, H. J. Allison, J. E. Morris.

Railways, Carriages, Coupling, Uncoupling, and Altering Position of Carriages and Engines.—J. W. Dyson, C. Barrett, W. R. Lake (com.), W. Morgan-Brown (com.), G. Turton, H. H. Hawgood.

Reaping, &c.—G. Kearsley and E. Whitworth, J. P. Laurence (com.), S. Culpin, A. McGregor.

Reflectors, &c.—H. B. Fox.

Refrigerating, Cooling Liquids, Making Ices.—C. C Palmer, K. Knott, C. Pieper (com).

Registering, &c.—B. Tower, H. H. Lake (com), G. H. Manton, E. Braubach.

Retorts.—H. T. Hickman.

Roads, Paths &c.—W. A. Blake, W Smith.

Ropes, &c.—W. T. Cheesman, A. Waithman.

Safes, &c.—L. A. Groth (com.).

Scents, &c.—W. Bartram.

Screws, Screw Drivers, &c.—H. Waite, O Schober.

Sewing and embroidering.—W. R. Lake (com.), A. Anderson, S. Mort and G. Walker.

Ship and Boatbuilding.—A. M Clark (com), F. E. Todd, H. P. Scott and T. Donaldson, W. L. Gray, W. R. Lake (com.), L H. Gullachson and W. Brydon, R. H. Tweddell.

Ships' Boats (lowering, &c.)—W. Richardson.

Ships (raising).—R. Punshon.

Ships' Cargoes (Loading, &c.)—G. Allix.

Shot, Shell, Bullets, Cartridges, Percussion Caps, &c.—S. Nordenfelt.

Show Cases, &c.—J. Kershaw, H. J. Haddan.

Sifting, Sorting, and Separating.—A. W. L. Reddie (com.), W. R. Lake (com.).

Sign Plates, &c.—A. McCaw, J. Stevenson and J. P. Orr, J. Edwards, T. L. Switzer.

Signals, Alarms, Communicating Apparatus, Conveying Sounds.—H. H. Lake (com.), W. Morgan-Brown (com.), H. J. Allison (com.), W. R. Sykes, W. P. Thompson (com), W. T. C. Pratt.

Smoke (Preventing, &c.)—J. Gurney.

Soap.—W. Smith.

Sounds (reproducing, &c.)—W. Clark (com.), A. C. Engert.

Spades, &c.—G. Prior.

Spinning and Preparing for Spinning.—J. Camm, J. C. Mewburn (com.), J H. Johnson (com.), J. H. Skinner, S. Tweedale, W. P. Thompson (com.), J. Clough, J. Robinson, G. and E. Ashworth, L. Wilson, W. Sumner, J. C. Fell.

Springs.—R. L. Barker, W. Cowell and W. W. Chapman.

Stables, &c.—H. J. Haddan (com.).

Stamps (revenue), &c.—J. J. Sachs.

Starch, &c.—W. C. Locke.

Stays.—C. W. Allen.

Steam and other Boilers, Cleaning and Preventing Incrustation of Boilers, Water Feeding Apparatus for Boilers.—C. Pieper (com.), P. Sampson, A. Dervaux, A. M. Clark (com.), W. Gray. J. and J Hopkinson, T. Hudson, J. Windle, A. K. Irvine, E. A. Bourry, J. G. Cameron, G. Sinclair.

Steam Engines (Stationary, Locomotive, and Marine).—C. P. Deane, H. B. Young, H. J. Haddan (com), R. Duncan, J. A. and J. Hopkinson, B Fowler, R Burton and R. H. Shaw.

Stone, &c.—C Moreing, P. Jensen (com.).

Teaching, &c.—M. T. Foote, H. J. Allison (com.).

Telegraphs, Telegraph Printing Apparatus.—J. R. Edwards, S. Russell, R. and M. Theiler, R. C. Anderson, J. H Johnson (com.), G. Wells and A. Gilbert.

Tents, &c.—C. A James.

Tilling and Cultivating, &c.—A. M. Clarke (com), E. Edmonds (com.), E J. Lakeman, B. Fowler, R. Burton and R. H. Shaw.

Tobacco and Snuff, Cigars, Cigar-Holders, Pipe and Cigar-lighters, Smoking Pipes, Tobacco Pouches, &c.—F. W. Jonnes and J. Schopper.

Tramways and Tramway Carriages, Tramway, Locomotives.—J W. Dyson, J. Gowans, F. G. M. Stone, G. Ure, H. Sharp, J. E. Morris.

Traps for Drains, &c.—F W. Ann, S. S. Hellyer, A T. Angell, M. Wilson, T. Jewell.

Trimmings, &c.—L. Deschamps

Umbrellas, Parasols, &c.—W. Holland and R. Budd, S. Staight, B. Hunt (com.), J. T. and B. Lilley.

Upholstery.—W. R Lake (com), S. Ullmann (com.), S. Bowden (com.).

Urinals.—T Jowell

Valves, Taps, Stop Cocks, Plugs, Regulating the Flow and Pressure of Fluids.—C. Buckland, C. T. Mathew, F. Wirth (com.), J. H. Johnson (com), T. G Messenger, A. M. Clark (com.), T. B Plumtree, W. B. Dewhirst and G. Barker, W. Sargent, T. P. and E. J. Preston and J. S. Prestige, W R. Lake (com.), T. B Goslin and J. J. Brown, G. Sinclair, T. Jowell, B. Walker and J F. A Pflamm.

Varnishes, &c.—W. R. Lake (com).

Velocipedes, Bicycles, &c.—E. C. F. Otto, F. W. Jones, W. H. Monks, J. Hall.

Ventilation. Supplying and Purifying Air for Buildings, Mines, Ships, Carriages, &c.—L. J. Gilmore and W. R. Clark, F. Travis, W. Hickey and S. Barnett, H. Shiels, J. Howorth, A. Mill, T. Jewell, W. Cunningham.

Walking Sticks.—P. Jacquelin.

Washing, Cleansing, and Wringing Fabrics, Yarns, and Materials.—P. Mass and E. Doumenark, C. Phipps and E. Blackshaw.

Water-Closets, &c.—T. G. Messenger, W. Sargent, C. E. Monkhouse, W. R. Lake (com.).

Weaving, Braiding, Plaiting, Preparing for Weaving.—J H. Johnson (com), P. Evans and H King, J. Clayton and T. Richmond, S. Hargreaves, H. H. Lake (com.), E. R. Dutton (com.), R. Moss, H. J Haddan (com.).

*** *The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.*

GLUCOSE MANUFACTURE.

There appears to be quite a furore in the West in connection with the manufacture of glucose from corn. A large number of factories are being set up; one at Chicago, it is said, will have a capacity of 20,000 bushels a day. A bushel of corn produces 30 pounds of glucose (grape sugar), or 3 gallons of syrup. The sugar costs 2 cents. a pound, the corn selling at 40 cents. a bushel.

FEATHER PLUSH.

For some time past the ingenuity of several manufacturers has alighted upon the idea of utilising feathers as a material for weaving fabrics in various ways. We thus saw recently two samples of feather cloth which had come from France, and which consisted, apparently, of the down of feathers interwoven with fine woollen warp, in one case throwing the feathers to one surface, and in the other laying them upon both sides; the latter, especially, was a very interesting and exceedingly light cloth, which we understand is used in France for chest protectors, and is for that purpose more agreeable, though perhaps not so durable, as flannel or felt.

From a foreign patent we see that one manufacturer has protected a machine by means of which he produces a cloth or felt, in which he mixes finely broken feathers with wool, and then cards and felts them together. The machine he uses for the purpose is a combination of the opener and scutcher as used in cotton mills, and the fur formers employed in hat works. The feathers, which may be of any cheap kind, are placed upon a feed table, whence they pass under a drum set laterally with steel knives, which break the feathers; from this drum they pass between three small rollers and a superposed fluted and chased iron roller with a to-and-fro motion endways, as well as a revolving motion, and by which the reduced feathers are ground quite small, and, falling upon a travelling apron, pass on to a spiked drum running in a cage, whose office is to reduce any pieces which have escaped the action of the rollers. The pounded feathers fall to the bottom of the machine, whence a fan sends them into a proper receptacle, where the feathers are mixed at once with wool They may be blown direct upon the card table of a carding engine, which, in that case, must have a cover as is usual in carding cotton.

The mixture of feathers and wool can, of course, be made in any proportion. The inventor states that he has obtained the best results by felting the cloth; the laps made by the carding engines are jointed by friction under the influence of steam, then milled, dried, and subjected to the action of steam at a high temperature in a steam chamber, which latter action is said to thoroughly amalgamate the feathers and the wool.—*Textile Manufacturer.*

THE NEW YORK EXHIBITION OF 1883.

A Bill to provide for celebrating the one hundredth anniversary of the treaty of peace and the recognition of American independence by holding an International Exhibition of arts, manufactures, &c., in New York, in 1883, passed the Senate March 31 It incorporates the United States International Exhibition, composed of well-known New York gentlemen, whose official functions are to continue until the close of the Exhibition. It will be their duty to fix the date of the Exhibition, make the needed preparations for it on a site within the corporate limits of the city of New York, and to superintend the Exhibition during its progress. The Bill provides further that the corporation shall cease to exist on or before January 1, 1885 Congress may at any time alter or repeal the Act, and the United States are not to be liable for any of the acts or representations of the promoters of the enterprise. Not less than 1,000,000 dols. must be subscribed, and not less than 10 per centum thereof must be paid in before the corporation may do any corporate act other than organise, and no part of the capital, stock, or assets is to be withdrawn, refunded, or divided among the stockholders until all the debts are fully discharged.

Reviews.

KINGZETT'S NATURE'S HYGIENE.

"Nature's Hygiene: A Series of Essays on Popular Scientific Subjects, with Special reference to the Chemistry and Hygiene of the Eucalyptus and the Pine," By C. T. KINGZETT, F.C.S., &c. London: Bailliere, Tindall & Cox, King William Street, Strand, Paris, and Madrid. 1880.

Mr. KINGZETT is now so well known in connexion with sanitary chemistry, that every one will be in expectation of something valuable when there comes to hand a book on that subject of which he is the author. The keynote to the contents of this work is given in his prefatory remarks, viz.:—

Of the many scientific subjects which, during recent years, have strongly arrested the attention of the public, few have excited more interest than that which has been manifested, from time to time, regarding the reputed sanitary properties of the eucalyptus tree. But while this interest extended even to several European and other governments, and although the hygienic value of the eucalyptus is based upon an abundant and increasing amount of evidence, yet no satisfactory explanation of this influence has ever been presented to the public.

During some years I have spent much time in the study of what are known to chemists as processes of slow oxidation, and have communicated the results of my researches to various scientific societies. These investigations, conducted, so to say, in the laboratory of Nature, furnished a full and sufficient explanation of the sanitary properties of the eucalyptus tree, and they also proved that the pine tree exhibits characters of the same important order.

In bringing this work, therefore, before the public, I am really endeavouring to place before them a scientific research in a popular manner. In so doing, however, I have not merely described my own experiments, but have also given particulars of those of all others who have worked upon the subject, and have incorporated the results in a number of chapters, which deal with a variety of questions more or less intimately concerned with Nature's Hygiene.

Each chapter will be found to form a complete essay in itself, and thus the book combines the features of a continuous study of some processes of Nature's chemistry and hygiene, and of a series of articles on scientific subjects.

Wherever an educated public is to be found, there must also exist a demand for popular scientific literature; and it is towards feeding such a demand that I have ventured to contribute this work, trusting it may not be received altogether without favour.

The work is divided into nine chapters The first chapter has reference to the discovery of oxygen, water, ozone, and peroxide of hydrogen, their chemical relations and simple properties. The second chapter relates to the occurrence of oxygen, ozone, and peroxide of hydrogen in nature; the processes by which they are produced, and their further properties, particularly those relating to the phenomena of respiration and oxidation. The third chapter is occupied with studies of the processes of chemical oxidation, slow-combustion (decay or eremacausis), and putrefaction; their connection with the purity of the atmosphere, and their general sanitary bearings. The fourth chapter has reference to infectants and contagious disorders; the liability to contagion; embracing also a description of the germ and other theories of infectious disease, and the connection of epidemics with the process of putrefaction and other insanitary conditions. The fifth chapter treats of antiseptics and disinfectants considered as agents intended to arrest and prevent the spread of epidemics; their properties and modes of action. The sixth chapter has reference to malarial fever; its distribution and cause, together with a full descriptive and historical account of the alleged anti-malarial properties of the genus *Eucalyptus*, as observed in various countries. The seventh chapter contains a description of the essential oils and perfumes as natural products, their atmospheric oxidation in nature, the products which are thus formed, and the artificial imitation of the process; with special reference to the oils of eucalyptus and turpentine. A study of the antiseptic and disinfecting properties of those natural products which are formed in the atmosphere by the oxidation of essential oils occupies the eighth chapter; and the geographical distribution of eucalyptus and pine forests; the explanation of their hygienic powers as gathered from previous studies, and the determination of their extent and influence in nature, are dealt with in the ninth and concluding chapter

It would be difficult to point out any one portion of this work as more interesting or instructive than another; therefore we refrain from quotation, contenting ourselves by recommending the work as one that ought to be read by everybody interested in hygiene, and one may say that this will include all the world.

"Annals of Chemical Medicine." By J. L. W. THUDICHUM, M.D. London. Longmans, Green & Co.

THIS is the first volume of a new periodical issue, and though it has little of chemistry in the absolute sense, it is full of such chemistry as falls within the boundary line between that science and physiology The volume contains a large amount of interesting biographical information, amongst which will be found some curious anecdotes of Meyer's life, which seem to be new.

Infection and contagion are carefully and completele treated. The author summarises the views of others so justly that he cannot be considered to give undue prominence to his own

The chapters on the organic acids of the brain, and on the chemical decomposition of the bile, are of high interest.

"Blowpipe Analysis." By J. LANDAUER. Translated by J. Taylor and W. E. Kay, 1879. London. Macmillan & Co.

THIS is a work worthy of hearty commendation, and will, we doubt not, be appreciated by students. The first chapter refers to "apparatus and reagents" required, followed by one on the "Operations of Blowpipe Analysis," giving the reactions on the "Aluminium Plate"—Ross's—"Bunsen's Flame Reactions," &c. Chapters three and four relate to the reactions of the elements in combination, and the systematic examination for them A series of tables, very simply arranged, are given at the end of the work. A coloured diagram of the spectra of the elements prefaces the work

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"Electro-plating: a Practical Handbook, including the Practice of Electro-typing." By J W. URQUHART, C.E Crosby Lockwood & Co.

This work provides working directions in all respects applicable to the practice of the plating shop and the wants of amateurs. Scratch-brushes, batteries, dynamo-electric machines, electro-type, including steel-facing and the rapid process employed for illustrated newspapers, deposition of silver, silvered specula, nickel-plating, and electro-gilding are among the subjects treated. The book is not overloaded with details, and is eminently readable. Though there is little of theory, yet its science is sound so far as it goes. Indeed, the work is worthy of all praise.

RONALDS' COLLECTION OF WORKS ON ELECTRICITY.

"Catalogue of Books and Papers relating to Electricity, Magnetism, the Electric Telegraph, &c., including the Ronalds' Library." Compiled by SIR FRANCIS RONALDS, F.R.S., with a Biographical Memoir. Edited by Alfred J. Frost, Acting Librarian of the Society of Telegraph Engineers, and Member of the Library Association of the United Kingdom London: E. &. F. N. Spon, 46, Charing Cross. New York: 446, Broome Street, 1880.

THIS catalogue is published under the conditions of the trust deed of a library formed by the late Sir Francis Ronalds, and which is now in the possession of the Society of Telegraph Engineers.

It contains not only a record of the works in the library, but also of all other works on the subject of electricity, &c., which came to the notice of Ronalds.

It has been published by the Society at great cost, and no expense has been spared to render it as accurate as the nature of the work would admit.

The work has a considerable interest from having been the production of a man who is recognised as the "Father of English Telegraphs," he having invented and erected the earliest of all telegraphs, nearly 30 years before the electric telegraph became popular in this country. Ronalds was knighted in 1870, two or three years before his death.

The importance of this work cannot be over rated, being the first of its kind, and the Council of the Society state that they are very desirous that it should be as widely known as possible.

Corbett and Peele, the agricultural engineers of Shrewsbury, have issued an illustrated catalogue, which deserves our commendatory notice, especially when it is remembered that this firm was highly successful at the Sydney Exhibition.

"The Doom of the Great City" is a curious work, a review of which we are compelled to postpone.

INJURIOUS EFFECTS FROM VULCANITE PLATES.

SAMUEL SEXTON, M.D., in an article published in the *American Journal of the Medical Sciences*, for January, 1880, states that vulcanite plates produce diseases that are more frequently the source of reflex aural disease than any others worn. They have been in use for over twenty years, and their adoption is very general. The constituents of this are caoutchouc, the sulphur required in the vulcanising process, and vermilion or the sulphide of mercury, used for the colour it imparts. The quantity of the latter ingredient is believed to be equal in weight to both the other substances mentioned; accurate knowledge, however, is withheld by the manufacturers.

The gradual disintegration of these plates, as they are worn in the mouth, liberates a salt of mercury whose poisonous effects are well known. But besides yielding a poison, they are otherwise injurious to health. Inquiries from dentists elicit the fact that at least one-third of all those who attempt to wear them experience great irritation of the mouth, an irritation that is frequently accompanied by hypersecretion of the buccal fluid. The sufferer usually lays aside the plate until informed of the necessity of becoming accustomed to its presence by uninterrupted use. Vulcanite is a non-conductor of heat, and the effect of its contact with the highly sensitive tissues of the mouth is to produce hyperæmia and inflammation. Another source of injury is the very close contact of these plates, which is maintained by atmospheric pressure, and may favour the absorption of their substance,

INVENTORS' INSTITUTE.

THE Annual General Meeting of the Inventors' Institute took place at 4, St. Martin's Place, Trafalgar Square, on Thursday, 20th May, at 4.15 p.m. F. H. Varley, Esq., C.E., the Chairman of the Executive Council, was voted to the Chair, and took the same accordingly. Those present were:—J. P. Cutts, Esq., J. Greenfield, Esq., T. Blanchett, Esq., T. Morgan, Esq., Messrs. Hillier and F. W. Campin (Secretary) and other well known members of the Institute.

The Minutes of the last Annual General Meeting having been read by the Secretary were passed as correctly entered.

The Chairman then requested the Secretary, MR. F. W. CAMPIN, to read the Report of the Executive Council, which was as follows:—

EIGHTEENTH ANNUAL REPORT.

The Executive Council, in presenting this the 18th Annual Report, do so under unprecedented circumstances, for very recently a general election of members of Parliament has taken place, and Her Majesty has appointed a new Government (to supersede the former one under the premiership of Lord Beaconsfield), so that matters governmental and political have up to the present time not progressed so far as to enable the Executive Council to state what course the new Government will adopt with regard to the Patent Laws, though encouragement for hope of a good settlement of this question is small indeed, looking at the fact that Lord Selborne, the Lord Chancellor, is a declared opponent of any patent law whatever, and Lord Granville, another member of the ministry, holds similar opinions on the subject. Hence it would be almost hoping against hope to expect that during the present Session of Parliament anything will be done to benefit the inventor's cause quite irrespective of the political situation which keeps matters of this sort in the background.

But though this view of the matter is without doubt perfectly sound, yet it is right that inventors should be informed that Mr. Anderson, M.P. for Glasgow, appears to be willing to again bring forward a Bill for amending the Patent Laws, which proposes to enlarge the term of Letters Patent from 14 to 21 years, requires the appointment of permanent Commissioners, and reduces the cost to a considerable extent, that is to say, the existing stamp duties are, we understand, to be replaced by the following, viz., stamp on petition for Letters Patent £1 5s.. and on certificate of notice to proceed £1 5s., &c.

This Bill, though it aims only at an instalment of reform, viz., reduction of cost (the requirement of permanent commissioners and extension of time being the only clauses outside of cost), and does not in any way reverse the present system, either in regard to granting of Patents or in reference to rendering the grant more secure and protective, is nevertheless, a step in the right direction. It has been estimated as such by the Executive Council, and looking at the difficulty of obtaining any common agreement on the details of a good Patent Law, many persons whose opinions are worth consideration have suggested that such a Bill might be an acceptable settlement of the Patent question for the present time, if the term of provisional protection were prolonged to one year, as in the late Attorney-General's Bill, and its cost reduced to 10s.

Of course one cannot speak with certainty even with regard to Mr. Anderson's efforts, as for the present everything Parliamentary is in a nebulous state, but it may with some confidence be suggested that if the Inventors' Institute should think it desirable to solicit Mr. Anderson to bring in this Bill, it seems very probable he would comply with their solicitation, especially as the working men's organisations seem to favor the introduction of such a Bill.

With regard to the Bill brought in by the late Government, substantially a reiteration of other Bills brought in by them and dropped, we have only to state that it shared the fate of its predecessors, and was not proceeded with.

Keeping still to the Patent Law question, we have to state that we understand from our worthy vice-president, Admiral Selwyn, that the Paris International Congress still continues its labours; and hopes of Patent Law reform from the action being taken by this Congress, are by no means small.

Although the Patent Laws have absorbed the attention of the Executive Council to a considerable extent, the other objects for which the Institute was established have not been neglected, but owing to the very inclement weather that has prevailed during the last session, it has been almost impossible to get up good evening meetings; still several papers of importance have been read at well attended meetings, and discussions had thereon. Amongst these we may mention papers on "Miners' Safety Lamps," by Mr. Purdy; "On Brilliancy in Lighting," by J. Cadett, Esq.; "On Electric Lighting," by F. W. Campin, Esq., and "On Improvements in compound Engines," by Mr. Turnbull, when Mr. T. Morgan also explained Worthington's "Grapharc" and other inventions.

The Executive Council propose that the thanks of the Institute in General Meeting assembled be given to all the readers of the papers above-mentioned, as also to the inventors concerned therein.

The Patent Law question has been discussed at several meetings, conferences being held on the subject, notably on 5th June, 1879, when Messrs. H. Broadhurst (now M.P. for Stoke), G. Howell, S. Brighty, and others attended as representative working men.

As regards the finances, the Executive Council have to state that a balance-sheet has been prepared, and audited by J. P. Cutts, Esq., auditor, and is submitted to the present meeting.

In conclusion the Executive Council may observe that they have now adverted to every matter proper to be brought before the general body of the members, and it therefore only remains to state that according to the rules, one-third of the Executive Council have to-day to retire from office, but are eligible for re-election. Those who now retire in accordance with seniority are Messrs. T. Blanchett, S. Calley, Captain Fairholme, R.N., and T. Paterson. With regard to Captain Fairholme it is to be remarked that he has resigned the membership of the Institute, and is therefore ineligible for a seat on the Council.

The Report having been read, the Chairman moved, and Mr. Morgan seconded, and it was resolved unanimously, that it be received and adopted and annexed to the Minutes of the Meeting.

The Acting Treasurer, Mr. G. A. Stretton, then produced and read the balance-sheet—No. 1, receipts and disbursements; No. 2, assets and liabilities. Audited by J. P. Cutts, Esq., the auditor of the Institute; and, on the motion of the Chairman, seconded by Mr. Greenfield, the balance-sheet was passed and adopted unanimously.

The Secretary then adverted to the fact that at the annual general meeting immediately preceding the last one the Presidentship and Vice-Presidentship, as per published lists, were rendered permanent; hence no re-election of those officers was necessary; but it was open to any member to propose any addition to the list, and he mentioned that there were two gentlemen, Mr. F. H. Varley, who had for years past held the position of Chairman of the Executive Council, the esteemed member now occupying the chair, also Dr. J. M'Grigor Croft, who might well be considered as worthy of the position of Vice-Presidents. The Executive Council had, however, made no recommendation as to any addition to the present list. Upon this a discussion ensued as to whether it was not requisite, according to the rules, to have annual re-elections of all officers of the Institute great or small, and in case there should be any difficulty as to this the Chairman moved, and Mr. Greenfield seconded, that the present President and Vice-Presidents stand re-elected, if re-election be found necessary.

The General Council list was then read over by the Secretary, and the whole of the gentlemen on the list were, on the motion of the Chairman, seconded by Mr. Greenfield, unanimously re-elected.

It was resolved, on the motion of the Chairman, seconded by Mr. F. W. Campin, that the retiring members of the Executive Council, namely, Messrs. Blanchett and T. Paterson, be re-elected, and in the place of Captain Fairholme, who has retired from the Institute, Mr. J. P. Cutts, be elected as a member of the Executive Council.

It was moved by the Chairman, and seconded by Mr. Blanchett, that Mr. F. W. Campin be re-elected Secretary. This resolution was supported by Mr. J. Greenfield, who desired, to add an expression of opinion on behalf of the members of the Institute of the advantage gained by its retaining the services of a gentleman so earnest in the cause of Patent Law reform, and so well qualified to advise the Institute on the legal questions involved therein.

It was moved by the Chairman, and seconded by Mr. Blanchett, and carried unanimously, that Mr. J. P. Cutts be elected the Auditor of the Institute.

It was moved by the Chairman, and seconded by Mr. Blanchett, that the rules be in practical effect so far amended that nothing therein contained shall be deemed or taken to require Executive Council meetings to be held during the months of July, August, or September, unless specially required.

The usual votes of thanks to the President, Vice-Presidents, Executive and General Councils, the Secretary, and the

Auditor, also a special vote of thanks to the Chairman of the day, F. H. Varley, Esq., C.E., closed the proceedings.

PORTLAND CEMENT AND CONCRETE.

At the Institution of Civil Engineers, on 11th May, W. H. Barlow, F.R.S., President, (a Member of the Executive Council of the Inventors Institute), in the Chair, three papers were read, the first on "The Manufacture and Testing of Portland Cement," by Major-General H. Y. D. Scott, C.B., R.E., F.R.S., Assoc. Inst., C.E., and Mr. Gilbert R Redgrave, Assoc. Inst. C.E

The history of the early manufacture of Portland Cement was involved in considerable obscurity, and the conditions which had rendered possible the manufacture of the cement, now recognised as Portland, seemed to have been arrived at only very gradually. The term "Portland Cement" first occurred in the specification of a patent granted to Joseph Aspdin, a bricklayer of Leeds, in 1824. Aspdin did not appear to have made true Portland Cement, nor was his mode of manufacture identical with that which had since been generally adopted. His son Wm. Aspdin was, however, one of the earliest makers of genuine Portland Cement, and had a factory at Northfleet, trading with partners as Maude, Jones, and Aspdin. Subsequently as Robins, Aspdin, and Co., he shared with Messrs. J. Bazley White and Sons, the reputation of having been the founders of the Portland Cement manufacture in the London district. The elaborate series of tests conducted for the Metropolitan Board of Works by Mr. John Grant, M. Inst., C E., between the years 1859-71 might be said to have placed Portland Cement in the first rank as a building material, and it had been the means of fixing and formulating the knowledge of this material. Mr. Grant's observations had been supplemented by those of Messrs. Colson, Mann, and others, and there now existed a vast store of information respecting the use and treatment of Portland Cement. Mr. Henry Reid had also thrown much light upon the manufacture and production of this cement.

The raw material suitable for the manufacture of Portland Cement existed in great abundance in nature, and, with proper care, a high-class Portland Cement might be produced in almost any country. The mode of mixing the chalk and clay generally employed in England for the manufacture of the cement was not so systematic as could be desired. The old-fashioned plan was to wash together, or incorporate, the chalk and clay with a large excess of water in a wash-mill. The resulting milky fluid, or wet slip, was then run into a series of shallow reservoirs, or backs, where these ingredients subsided, and the clear top-water was gradually drawn off from the surface. After remaining for six or eight weeks in the backs, the slip, which had attained a pasty consistency, was removed in barrows to drying floors, where the remaining water was expelled by bottom heat, conducted in flues The dry slip was then calcined in kilns with inter-stratified coke, and the clinker which was produced was ground into a fine powder, and was ready for use as Portland Cement

The modern plan was to grind the chalk and clay together, with the smallest quantity of water possible, and to ensure the perfect reduction of the coarse particles, either on the method of Mr W. Goreham, by passing the wet slip through mill-stones, or, as recommended by Mr. V. de Michele, by employing a rubbing surface of metal plates which surrounded the wash-mill. In the most recently improved plan of drying, the wet slip was conducted at once into chambers attached to the kilns, and the waste heat from the calcination served to dry the next charge. This plan was invented by Mr. I. C. Johnson. Mr. de Michele had also employed the waste heat from the kiln, which involved the use of a roof over the chambers. Other plans of utilising the hot gases from the kilns had been introduced by Messrs. J. B. White and Brothers, and by Mr. R. A. Gibbons. In grinding the clinker, it was of great importance to reduce the cement to a fine state of sub-division, and to exclude all "core," or hard particles, by sifting, as the hard particles might be sources of danger to the cement; at the best, they only acted as so much sand. All cement was benefited by spreading it in thin heaps on the floor of the warehouse; this operation was termed "purging" the cement.

Passing on to the subject of testing, the authors stated that, strange and anomalous as it might seem, although except in rare cases Portland Cement was never used neat, or subjected to a direct tensile strain, it had been the universal practice to test the neat cement by means of tension. German cement users and producers had resolved, after a general conference, to adopt a sand test, and to employ a standard testing machine. The sand test was made with 3 parts of prepared sand to 1 part of cement. The briquettes had a sectional area at the neck of 5 square centimetres, equal to 0·775 square inch. The briquettes were tested twenty-eight days after they had been made, one day being passed in air and twenty-seven days in water. The breaking weight, in a machine of special construction, had been fixed at the rate of 113·8lbs. per square inch. The mode of preparing the sand by sifting out all the coarser and finer particles was provided for, and also the quantity of water to be employed. The authors, after due consideration of the various difficulties and objections to a change in the mode of testing Portland Cement, proposed the following general tests for English Cement :— 1. The whole of the cement to be ground fine enough to pass through a sieve of 40 × 40 - 1,600 meshes to the square inch without residue. 2 The cement to weigh not less than [illegible] per cubic foot, filled from an inclined plane, at an angle of, say, 45 degrees. 3. The cement tested with 3 parts of standard sand, must have a minimum strength of 112lbs. per square inch in twenty-eight days, during one day of which it had been in air and twenty-seven days in water.

The second paper read was on "Portland Cement Concrete, and Some of its Applications." By Mr. E. A. Bernays, M. Inst., C.E.

In this communication the author gave the results of his experience in carrying out the large works for the extension of H. M. Dockyard at Chatham. When these works were commenced, in 1867, so little confidence was placed in Portland cement, that that material was not even mentioned in the contract specifications; grey stone lime, blue lias lime, and pozzolana being specified for all descriptions of mortar and concrete. Soon afterwards, however, it was found desirable to substitute Portland cement for the above materials. For all ordinary concrete, it was ascertained that a mixture of 1 part of Portland Cement with 12 parts of shingle, gave a better result at the same or less cost than the concrete provided for in the specification, to be composed of one part of Warwickshire blue lias lime to 6 parts of shingle. The Portland cement used throughout the Admiralty Works had been of good, but not of a [illegible] character It was specified to weigh not less than 112lbs. per bushel, to be finely ground, and to bear a breaking strain of not less than 650lbs. on the section of a briquette 1½ inch by 1½ inch. In a total quantity of upwards of 50,000 tons, the mean weight was 110⅝lbs. per bushel; the average breaking strain of a briquette, of the above section, 773⅓lbs.; and the fineness, such as to allow not less than 75 per cent. by weight to pass through a sieve with 50 meshes to the lineal inch. The author, while admitting the superior value of fine grinding of cement, when combined with great weight, expressed a doubt whether in England, where a fairly good article could be got, at moderate cost, it was worth while to incur the increased expense of heavy and very finely-ground cement. When used in foreign countries, where the cost of freight and transport was serious, he thought that almost any outlay on the first cost of the cement, to make it go further, when mixed with sand or gravel, was desirable. The large concrete walls at Chatham had been singularly free from the horizontal and vertical cracks so often noticeable in concrete walls. The author attributed this partly to the uniform practice of turning out all cement from the bags into a shed for, at least, three weeks before using, and partly to the care taken to carry up the work in long lengths each day, instead of in great heights. His practice was to carry up the work in about 18-inch lifts only. Over the greater part of the works at Chatham, the walls, though mainly of concrete, were faced with a veneer of brickwork 3 feet thick, with bond courses of brickwork 21 inches thick, passing through the walls at intervals of 6 feet in height. At the eastern end of the works, however, the great depth at which satisfactory foundations were found, and the necessity of passing through 35 feet of soft mud before reaching good bottom, necessitated much greater strength and consequent thickness of walls. In order to construct these without increased cost it was decided to omit the brickwork, and build them wholly of concrete. While it was considered that, for all purposes of strength as a retaining wall, concrete made of 1 part of cement to 12 parts of shingle was amply sufficient, it was felt that concrete so made was not strong enough to withstand the rubbing of ships' fenders, boats, or vessels. Early in 1871 the author tried the experiment of facing this common concrete with a coating, 9 or 10 inches in thickness, of superior concrete carried up simultaneously with the commoner material. This concrete was composed of 4 parts of furnace-slag broken into small cubes by a stone-crusher, 2 parts of clean Thames sand, and 1 part of Portland cement. The experiment proved successful, the adhesion between the two descriptions of concrete being perfect. All the exposed surfaces of concrete walls built since that date had been so faced. The same principle had been applied to the lining of subways, culverts, penstock shafts, &c.; but, in these cases, where the face of the concrete was less liable to abrasion, broken flints had been substituted for the furnace-slag, owing to the difficulty of procuring the latter, in the locality, in sufficient quantity. For all concrete, but especially when used for facing, the author advocated a free use of water in mixing. He had never found any disadvantage from the use of concrete in a wet state. The success that attended the facing of vertical surfaces of walls with superior concrete had led to its use in many other ways He had applied it to the horizontal and vertical faces of copings and steps, for curbs to street paving, for the areas and yards of dwelling-houses, floors of kitchens and sculleries, and to the facing of concrete blocks for house-building. For copings and steps he made use of granite spauls crushed into small cubes; but for all surfaces exposed to foot traffic he preferred small pebbles of shingle that would pass through a ¼-inch mesh sieve. While for ordinary concrete, on faces or elsewhere, the author used a minimum of one-third of

the entire bulk of sand; where the concrete was exposed to foot traffic he had found it necessary to wash out all sand, and to use Portland Cement only as the matrix for the flint, pebbles, crushed granite, or furnace-slag. His practice was to use for these facings 1 part of Portland cement to 2 parts of the aggregate, whatever it might be. For the copings of sea walls he applied a facing 2 inches thick, but for ordinary footways or paving a facing of only ¾-inch was considerably more durable than the best Yorkshire paving. At ordinary London rates the author estimated the cost of concrete walls, composed of 1 part of Portland cement to 12 parts of shingle, at 7s. 2d. per cubic yard, of 1 to 9 at 8s. 2⅓d., and of 1 to 6 at 10s. 3d. He estimated that the timber framing added from 4d. to 6d. per cubic yard to the cost of the walls, and the facing of slag or flint about 2⅓d. per cubic yard on thick walls. At these rates such walls as had been built at Chatham could be constructed, including facing and framing, at something less than 8s. per cubic yard.

The third paper read was on "Portland Cement, its Nature, Tests, and Uses," by Mr. John Grant, M. Inst. C.E.

After referring to the greatly extended use of Portland Cement during the last 20 years, to the improvements which had been made in its manufacture, and the care given to the best methods of economising its use and testing its quality, attention was drawn to what had been done in Germany, more especially during the last four years. In January, 1877, a committee, appointed the year before, of four Associations of Engineers, Architects, and Manufacturers of Cement, &c., had, at their meeting in Berlin, agreed upon a series of rules to be observed in the production and supply of cement. By these the weight to be supplied in casks and sacks was determined, and certain tests established for the quality of cement, particularly as to its fineness and tensile strength. The latter was to be tested by briquettes of uniform shape and dimensions (5 square centimetres breaking area), made of cement and sand, in the proportion of 1 part of cement to 3 parts of sand. The apparatus for this purpose was agreed upon. The age of the briquettes when tested was to be 28 days. The cement was to be ground so fine that the residue on a sieve of 900 square centimetres, equal to 72·2 per lineal inch, should not exceed 25 per cent. This was afterwards reduced to 20 per cent. The sand for testing was to pass through a sieve of 60 meshes per square centimetre, and to be retained on one of 120 meshes per square centimetre, equal to about 20 and 28 meshes per lineal inch. The tensile strength after 28 days was at first 8 kilogrammes per square centimetre, equal to about 114lbs. per square inch, but was afterwards increased to 10 kilogrammes per square centimetre, or about 142lbs. per square inch. There could be no doubt that the standards thus established for fine grinding, and for testing the cementitious value of cement when mixed with a large portion of sand, had exercised a beneficial influence on the quality of the Portland cement manufactured and used in Germany. This result had been arrived at by a combination of the knowledge and ability of those who produced, and those who had to use, this important article. The same standard rules, with slight modifications, were afterwards adopted in Austria. To these standards all cement manufactured in, or imported into, these countries must conform. In England engineers and cement manufacturers had not been idle, and the subject was now much better known than it was 20 years ago.

A brief description was given of the more essential points in the manufacture of cement, the materials used, and the burning and grinding. Reference was then made to the characteristics of good cement, its weight, fineness of grinding, freedom from tendency to expand or blow, its time of setting and hardening, the effect of time, heat, and moisture, the influence of sulphate of lime and acids, the proportion of sand used with it, the coarseness or fineness of the sand or gravel, its mineral character, and freedom from dirt, grease, clay, or soft foreign matter. The weakening effect of using too much water was pointed out, and the advisability of compressing or ramming concrete when possible. The relative advantages of using concrete in blocks, and in a soft state, and of keeping it damp till it had thoroughly set, were pointed out. The different modes of testing by compression and by tensile strain were then discussed, and the apparatus used in Germany, and in the experiments quoted in the appendix to the paper, were described, with the modifications and improvements in the form of the briquettes, and in the mode of making them. Suggestions were next offered for testing cement in a uniform manner, so as to prove its soundness, strength, cementitious value and other qualities, and to admit of comparison with other observations. The harbour at the North Sea entrance to the Amsterdam Canal, the Victoria Docks, North Woolwich, and the Docks at Chatham, were mentioned as recent examples of works on a large scale made entirely of Portland cement concrete; and the numerous purposes to which it was now applied, and the economy effected by its use in the sewers and embankments of the metropolis, were alluded to.

In an appendix were numerous tables illustrating the different points referred to in the paper, such as the specific gravity and analyses of different cements, the results obtained by different modes of testing briquettes of various forms and sizes, and when made with different proportions of cement, sand, and water. From these it was shown that there was great increase of strength and economy by grinding cement very fine. Some coarsely ground cement gave high results when tested neat, but low when tested with sand. The tests proved the impossibility of ascertaining the true cementitious value of cement by testing it neat, or otherwise than with a mixture of sand, and also showed the waste involved in coarsely ground cement. The influence of sand of different degrees of fineness on the time which cement took to set, the strength of various limes, selenitic lime, and cement, the tensile and compressive strength of the same cements, some experiments on expansion, with form of specification for cement, for mortar and concrete, and tabulated forms for registering results of tests and experiments were also given.

SONG.

Were Paradise' bright streams my own,
They'd murmur to enchant your ear,
And ev'ry charm earth has not known
Enwrap the misty landscape near.
All you have dreamt of bliss divine,
Should breathe the air of Eden round you,
And fate's worst frowns become benign;
Love should so charm the woe that bound
you!
Ah! so I'd shelter you.

What can I give to make you blest?
My very soul is all your own,
As it has been in deep unrest;
The severing days so slowly flown.
Could I lift your grief-burden up,
And bear it with me to the grave;
Believe me, life's divinest cup
Would press to lips it could not save!
Ah! could I shelter you.

V. Gonville.

GAS AND ELECTRICITY.

In his recent inaugural address before the Society of Telegraph Engineers, London, President W. H. Preece said:—

The electric light has been making considerable progress, and is gradually forcing itself into practical use, in spite of many of the drawbacks to its employment that have yet to be removed. The lamp of the future has not yet been produced, though steadiness and duration have very much advanced during the past twelve months. There is very little room for improvement in the generating machine, for both the Siemens and Gramme machines convert about 90 per cent. of the energy thrown into them into electric currents, and this is a duty which no other kind of machine can show.

One of its most notable and useful applications has been on board ship, to further the operations during the night in laying and repairing cables. I was present on board the steamship Dacia, in the Mediterranean, when this was done, and the success was unequivocal.

The Brush machine has recently been introduced into this country, and its performances are certainly wonderful. It produces an electromotive force of over 800 volts, and I have seen it maintain 20 very steady arcs joined in series. Sixteen appear to be its efficient limit, and this number of lamps, giving over 1,000 candle power, are easily maintained by an expenditure of 13½ horse power. The performances of the Brush light are certainly the most advanced form the electric light has yet taken. There are over 800 of these lights in the United States, and it is worthy of notice that it has quietly crept into existence without the aid of the ubiquitous and omniscient newspaper correspondent, or the transmission of any sensational telegrams, to the detriment and discomfort of gas shareholders.

It is assumed by many that the electric light is devoid of heat, but Professor Dewar has shown that a Siemen's arc radiates heat equivalent to 3 horse power per minute. Moreover, the use of such powerful currents, unless carefully directed, are dangerous to life and limb, and may even, unless properly protected, result in fire.

Gas is not going to be affected by the electric light. The proper function of gas is to generate heat. 94 per cent. of the ingredients of gas are consumed in generating heat, and only 6 per cent. in producing light. It is remarkable that so amenable and tractable an agent for heating purposes has not been more utilised, but the fact is that the public is ignorant of its properties, careless of its employment, and callous of its defects. It is not too much to say that 50 per cent. of the gas manufactured is absolutely wasted for illuminating purposes by the wild extravagance with which it is burnt, and by the want of those systems of regulation which have been introduced to compensate for irregularities and excesses of pressure.

AN APPEAL.

Mr William Templeton, well-known in his day as the author of many valuable mechanical books, died some years ago, leaving a wife and family in necessitous circumstances. His daughter, now sixty years of age, struggled hard to support her aged mother, but her aid, it appears, can be no longer relied upon, hence an appeal has been made on behalf of the family. Subscriptions can be paid to our contemporary *Engineering*, at 37, Bedford-street, Covent Garden, London, or to Mrs. Templeton herself, at 26, London-street, London-road, Southwark, London, S.E.

A simple, convenient, and inexpensive refrigerator crate for transporting butter, fruits, meats, game, &c., has been patented by Mr. George W. Freeman, of Amboy, Ill.

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Past Presidents:

SIR DAVID BREWSTER, K.H., LL.D., F.R.S., &c., from the establishment of the INVENTORS' INSTITUTE, till his decease, February, 1868. LORD RICHARD GROSVENOR, M.P.

President, SIR ANTONIO BRADY.

THE SESSION 1879—1880

Members' Meeting at 8.15 p.m. on Thursday, June 3rd.

On June 3rd G. E. Pritchett, Esq., F.A.S., &c., on Important Improvements in Barometers and Thermometers.

Executive Council Meeting at 7.30, on same evening as above.

The Balance Sheet 1879-80 can now be inspected.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

Proceedings of the Institute.

MEMBERS' MEETINGS.

ON Thursday, 6th May, the meeting was arranged for "An Exposition of Inventions, and Discussion of Patent Law Question," however, nothing transpired requiring special notice.

On Thursday, 28th May, the Annual General Meeting was held at 4.15 p.m., and the proceedings are fully reported in another column.

EXECUTIVE COUNCILS.

On the 6th May no business was transacted requiring to be reported to the members in general.

On the 20th May, after passing the minutes of the last meeting of Executive Council, the draft report for the year 1879-80 was read, approved of, and ordered to be presented to the Annual General Meeting to take place on same day (this report is given in the account of the proceedings at the annual meeting).

The balance-sheet—Part I. receipts and expenditure, and Part II. assets and liabilities—which had been audited by the Honorary Auditor, Mr. J. P. Cutts, was put in by the receiver, Mr. G. A. Stretton, acting treasurer, and having been read by the Secretary, was passed, and ordered to be presented to the general meeting.

Mr. Anderson's proposed Patent Bill was approved of, and the Executive Council then adjourned.

Monthly Notices.

A new Use for the Telephone has been found by Herr Niemöller, it being capable of determining very quickly and accurately the resistance of liquids. It is substituted for the galvanometer in a galvanic bridge, and an induction current is used; then, if the resistances compared consist of a large liquid resistance on the one hand, and a Siemens resistance box on the other, so that the electro-dynamic constants of the branches are very small; if, further, a German silver or platinum wire be used as measuring wire; it is found that in the position where the galvanometer shows no deflection, the tone in the telephone has a well-marked minimum of intensity. Supposing the liquid resistance has 2,000 units, a variation of it, even 4 units, reveals itself in a displacement of the minimum position.

Ultra Violet Solar Radiation at Different Altitudes.—M. Cornu has been making some very exact experiments on absorption of same, the results of which he brought before the Académie des Sciences very recently. These observations prove that the absorption is not due to water vapour or to material particles, as generally believed, but that it is exercised by the gaseous mass of the atmosphere itself.

Spheroidal Matter.—M. Boutigny, at a recent Séance of the *Academie des Sciences*, gave a *resume* of the laws which rule matter in the spheroidal state. His fifth law of repulsive force at a sensible distance is represented as the most important, because antagonistic to universal attraction. Non-volatile bodies, as wax or tallow, are suspended in a red-hot capsule without vapour or gas arising from their decomposition. Water dropped from the height of 70 feet upon heated metal is repelled instantaneously by the repulsive force of the heat.

Salicylic Acid for the Preservation of Water and Wine is recommended by Herr Kolbe. It has been found, however, that either of those fluids treated with this acid, if kept in wood casks, exhibits no evidence of the presence of salicylic acid after a few months, the wood of the casks either destroying the acid or absorbing it.—*Athenæum.*

Dr. James Geikie, F.R.S., will shortly send to press a work entitled 'Prehistoric Europe: a Geological Sketch,' which treats of the principal climatic and geographical changes which have taken place in our continent since the commencement of the pleistocene or quaternary period. Mr. Stanford will be the publisher.

The Royal Society.—Out of the fifty-two candidates for the fellowship who have come forward during the present session fifteen have been recommended for election by the Council, namely, Thomas Clifford Allbutt, M.A., M.D., F.L.S.; Prof. John Attfield, Ph.D., F.C.S.; Henry Francis Blanford, F.G.S.; Rev. William Henry Dallinger; William Turner Thiselton Dyer, M.A., F.L.S.; Lieut.-Col. Henry Haversham Godwin-Austin; the Right Rev. Charles Graves, D.D., Bishop of Limerick; Prof. David Edward Hughes; Henry M. Jeffery, M.A.; Prof. Frederick M'Coy, F.G.S.; J. Fletcher Moulton, M.A.; Prof. Charles Niven, M.A., F.R.A.S.; John Rae LL.D.; Prof. J. Emerson Reynolds, M.D.; William A. Tilden, D.Sc. Of these two are mathematicians, three physicists, three chemists, two geologists, two naturalists, one physiologist, one botanist, and one geographer, ethnologist, and Arctic explorer. The election will take place at a meeting of the Society to be held on Thursday, June 3rd, at 4 P.M.

Bonsilate is the name given to a composition now being used in America as a substitute for ivory, hard woods, and the like; canes, dominoes, clock-cases, and ornamental objects are made of this new material. It is said to be made from finely ground bones agglutinated with silicate of soda.

The Source of the Force Exciting Electricity.—Every heat-phenomenon, emission as well as absorption, occasions under favourable circumstances an electric current. The current produced by the emission of heat has the opposite direction from that produced by absorption. If only one metal in a galvanic element is active, the electric force is proportional to the algebraic sum of the heat developed by the bodies acting upon each other within the element. If both metals are active the electric force is proportional to the difference of the algebraic heat-sums on the one and the other side. The power of polarisation in exciting electricity depends neither on the nature of the gas nor of the metal, but mainly on the chemical action springing from electrolysis. The power of two metals in one acid to produce electricity stands in a simple proportion to the heat which the metals in question evolve when they unite with the acid to form salts.

The Scientific Review

AND

SCIENTIFIC AND LITERARY REVIEW,

A RECORD OF PROGRESS IN

ARTS, INDUSTRY, AND MANUFACTURES.

INCORPORATING THE

JOURNAL OF THE INVENTORS' INSTITUTE.

JUNE, 1880.

THE CRIMINALITY OF BAD PATENT LAWS.

An appalling Boiler Explosion has occurred at Walsall, the dire effects of which as regards human life and suffering are described in a letter from the Mayor of that town (George Thomas, Esq.), which has appeared in the daily journals, and states the case as an appeal to the benevolent on behalf of the widows and orphans and other dependent relatives of the men who were killed and severely injured by that dreadful boiler explosion. Twenty-five are dead, and other deaths are expected. Including the families of all these, and of others who are temporarily disabled, we have (he says) a total of upwards of 120 persons to provide for. Most of these are in a state of abject poverty. Walsall is not a rich town, and moreover has long been severely suffering from the effects of trade depression. Nevertheless, a town subscription has been commenced, and has been most handsomely supported by many who, it is not too much to say, have strained liberality to the utmost in manifesting their sympathy for the poor widows and orphans who have sustained this crushing blow. The local fund now amounts to £2,000, but as the total of £6,000 which it is desired to reach is far too heavy a burden for this community, it is hoped that many humane persons amongst the general public will come forward to assist in a cause that appeals to all the tenderest feelings of our common nature. Now a calamity like this, if preventible, must somehow and somewhere entail criminality, and probably we shall (as is usual in such cases) have a desperate attempt made by men in authority to fix the criminality in the form of a charge of neglect of duty resulting in homicide, upon some fireman or attendant on the boiler who can be easily caught hold of and detained by the strong arm of the law. Certainly the last thing that will be done will be to throw the blame upon the great men conducting the government of the country, who by their perverse apathy or opposition as to the solution of questions which affect the progress of industrial, sanitary, and other improvements in our material well-being, have hindered our having command of means and appliances by the aid of which we might hope to be spared much of the calamitous effects of such dreadful accidents as above referred to.

Such thoughts as we have given utterance to are not the expression of the exaggerated views of a red-hot advocate of invention and inventors, and this will we think be conceded when we state that the learned Recorder of Walsall, Mr. J. S. Neale (whose impartiality should be unquestionable), according to a telegram to the *Echo*, in charging the Grand Jury said the recent boiler explosion at Walsall was a most melancholy and appalling lesson of the dangers that surround all modern machinery connected with steam, and of the necessity of adopting all safeguards that invention could suggest. It was within his knowledge that a patent to prevent boiler explosions, and which had every prospect of rendering such an accident as the recent calamity all but impossible, was on the point of being taken out ten years ago, but was delayed, and would probably be lost, through the unjust action of the Patent Laws. There was no law which ingenuity could frame which would confer a greater benefit on trade and commerce, also on humanity at large, than a reform in the Patent Laws by the reduction to the smallest and most nominal amount of the fees and costs in taking out new patents; and, in the place of such reduction, the substitution of an *ad valorem* duty of say five per cent. on every sale or transfer of every patent which by its success had become valuable. The comparative trifle for which patents could be protected in America was one great cause why she had gone ahead of us in scientific matters.

If these statements give a true view of the case it is evident that those who oppose the very existence of Patent Laws, like Lord Granville and Lord Chancellor Selborne, and even those persons like the members of the late Beaconsfield Government, who palter with the question and eventually leave it untouched, incur the grave responsibility of being constructively and eventually guilty of manslaughter in a moral, though not legal, point of view, and they will certainly deserve to be charged with the highest culpability, if after the warning thus given by the Walsall accident as set forth by the Recorder, the progress of Mr. Anderson's Bill for the amendment of the Patent Laws, by cheapening the cost of patents and providing for the better administration of Her Majesty's Patent Office, be stopped, unless indeed the Government will bring in and push forward another measure cheapening patents still more, and more thoroughly amending the Patent Laws. And no mere political improvement, how muchsoever it may please party men, can be balanced against a matter of such vital importance.

Proceedings of Societies.

ROYAL SOCIETY.

APRIL 8TH.—The President in the chair.—The following papers were read: "Note on Thermal Transpiration," by Prof. O. Reynolds,—and "On the Sensitive State of Vacuum Discharges," Part II., by the President and Mr. J. F. Moulton.

APRIL 15TH.—The President in the chair.—The following papers were read: "Description of some Remains of the gigantic Land-lizard (*Megalania prisca*, Owen) from Australia," II., by Prof. Owen, F.R.S.,—"On an Electro-magnetic Gyroscope," by Mr. W. de Fonvielle,—and "Report on the Exploration of the Caves of Borneo," by Mr. A. H. Everett.

INSTITUTION OF CIVIL ENGINEERS.

APRIL 6TH.—Mr. W Barlow, President, in the chair.—The monthly ballot resulted in the election of six Members, viz., Messrs. R Baillie, W F. Batho, J Dillon, C. H L. Kuhl, C. Y. O'Connor, and A. Sopwith; of sixteen Associate Members, viz., Messrs. R. F. Alford, J. Allsopp, A. E. Baldwin, W. Belton, P. H. Brown, C. G. Clarke, W Cooper, R F. de Salis, J. T Earnshaw, C. J. Grierson, W. H. Jones, E T. Lang, A. H. V. Newton, I. Spielman, W M. Vivian, and G. Wade; Mr. R. Anderson was made an Associate.

ROYAL INSTITUTION.

APRIL 5TH.—G. Busk, Esq., Treas. and V.P., in the chair.—Mrs. W. T. Houldsworth, Mrs. W Huggins, Capt. M. H Purcell, Capt. H. J. L. Turnbull, Rev. W T. Houldsworth, Prof. J. Dewar, Messrs W. Hills, G. Kelly, C. Paget, S A. Ralli, and P W. Squire were elected Members.

SOCIETY OF ARTS.

MARCH 11TH.—Prof. H. Roscoe in the chair.—A paper "On Balmain's Luminous Paint" was read before the Chemical and Physical Section by Prof Heaton.

MARCH 16TH.—Sir T. D. Forsyth in the chair.—A paper "On Transport and Trading Centres for Equatorial Africa," was read before the Foreign and Colonial Section by Capt. Foot.

MARCH 17TH—Lord A Churchill in the chair.—Seven candidates were proposed for election as Members—The paper read was "On the Art of the Silversmith," by Mr. H. Singer.

APRIL 2ND.—Andrew Cassels, Esq., in the chair.—Mr. Houghton read a paper before the Indian Section of the Society "On the Best Route for a Railway to India —A discussion followed, in which, among others, Sir. A. Cotton, Capt. V. Lovett Cameron, and Mr. Hyde Clarke took part.

APRIL 5TH.—the first lecture of a course of Cantor lectures "On the Decoration and Furniture of Town Houses" was delivered by Mr. R. W. Edis. The lecture was of an introductory character, and dealt with the influence of schools of art on design, the change introduced by fashion in decoration and furniture, and the moral influence exercised by artistic decoration.

APRIL 6TH.—R. B. Carter, Esq., in the chair.—A paper 'On Art in Japan" was read before the Foreign and Colonial Section of the Society by Mr. C. Pfoundes. The paper was fully illustrated by specimens of the art productions of Japan, and by a collection of photographs and native drawings of the scenery and principal buildings and temples of that country

APRIL 7TH.—Prof. Williamson in the chair.—Fourteen candidates were proposed for election as Members.—A paper "On Buildings for Secondary Educational Purposes" was read by Mr. E. C. Robins.

ASTRONOMICAL SOCIETY.

APRIL 9TH.—E. Dunkin, Esq, V.P., in the chair.—Lieut. T. P. Battersby was elected a Fellow.—The Astronomer-Royal was called upon to read a paper "On the Lunar Theory" He said: "Before I commence my paper I wish to refer to a matter which has no connection with my paper. I was prevented by illness from attending the anniversary meeting of the Society, or I should have been glad to advert to the volume of 'Observations made during Total Eclipses' which has been published by the Society, under the care of Mr. Ranyard, and to have said that I think it does honour to the Society as well as to Mr. Ranyard. In the *Monthly Notices* for January, 1874, I explained a new method of treating the lunar theory, in which the co-efficients were to be numerically investigated. I have been closely occupied upon the subject since that time, and I may say that for many years previously it had received a large share of my attention, and I now present the results contained in this paper with much confidence I need not say that the matter is of great importance, especially with respect to distant chronology and the identification of early total solar eclipses, and I think I have worthily bestowed some trouble on this subject if it enables us to speak with greater certainty as to such identifications.'—Mr. Christie read a paper, by Mr Ellery, of Melbourne, on the great southern comet, which was observed by him from the 9th to the 17th of February. At first its tail was forty-five degrees long but on the 12th of February it had almost disappeared to the naked eye and on the 17th it could only be observed with difficulty with the telescope.—A paper from Mr. Russell, of Sydney, on the same subject, was also read; and a letter from Mr. Hind (the President of the Society), in which he stated that there appeared to be a great similarity between the elements of this comet and those of the comet of 1843. Prof. Winnecke is also of opinion that the comets of 1843 and 1880 are identical, and he suggests that they may also be identical with the comet of 1695. The observations of the comet of 1843 were not such as to give a very satisfactory determination of its period. Hubbard determined its period to be thirty-seven years, but a parabolic orbit would also fairly satisfy the observations Prof. Weiss, of Vienna, is of opinion that this comet may also be identical with the comet 1106, which also passed very near to the sun, but from the meagre accounts of its place amongst the stars its orbit can only be very roughly determined.—Mr. Marth suggested that the very unequal period between the returns to perihelia of these comets might probably be accounted for by the resistance of the corona through which the comet would pass at its perihelion passage. Sir Isaac Newton's comet passed within a distance of three-tenths of a solar radius of the photosphere.—Mr Common read a paper "On the Nebula in the Pleiades," which he had observed with his 36-inch telescope, he had been unable to see anything of the comet, although he had carefully searched in the positions indicated in Mr. Hind's ephemeris.

SOCIETY OF ANTIQUARIES.

APRIL 8TH.—E. Freshfield, Esq., V.P., in the chair.—The Auditor's Report was read, and notice was given of the anniversary meeting, for the election of the Council, President, Trersurer, and Director, on Friday, April 23rd (being St. George's Day), at 2 P.M., and that no Fellow in arrear of his subscription would be entitled to vote on that occasion.—Mr A. W Morant communicated to the Society that he had in his possession three iron chests, similar in character to those exhibited by Mr. Robins on May 29th, 1879, and described in the *Proceedings*, 2nd series, vol. iii. p. 165.—Mr. H. M. Westropp exhibited what he stated to be a Saxon iron sword, found in the Isle of Wight, at St. Lawrence, near Ventnor, in the cleft of a rock, about six feet below the surface. Mr. A. W. Franks observed that this object should rather be called an iron bar, to be hereafter made into a sword-blade, than a finished sword. Objects of a precisely similar character, 147 in number, had been found close together at Bourton-on-the-Water, and were described in the *Proceedings*, 2nd series, vol. i p. 233; see, too, 1st series, vol. iv. p. 188. He had also given an account himself of similar bars or blades found in this country in one of the forthcoming volumes of *Archæologia*, xiv. ii. p. 263—Mr. W. M. Wylie communicated a paper on certain masses of smelted iron found in Switzerland and other countries. The Swiss specimens had been found at Hedinger, near Zurich, about eight feet below the surface. These masses were of quadrangular form, with ends diminishing to points, after the manner of a double pyramid. Mr. Wylie, called attention to similar specimens in other parts of the Continent.—Mr. J. J. Rogers exhibited, through the Director, some Anglo-Saxon antiquities of silver, discovered many years since at Trewkiddle, near St. Austel's, Cornwall. They were found in 1774, when searching for tin, in an ancient streamwork, and were exhibited so long ago as May, 1788, before the Society by the then owner, P Rashleigh, Esq., of Menabilly, in Cornwall They are figured in the *Archæologia*, vol ix. p. 187, pl viii The most remarkable of these objects was a double-plaited chain of silver, dividing at the lower end into four strings, terminating in knots, and supposed to have been a *disciplinarium*, or penitential scourge Another object seemed to be a chalice, with a semi-egg-shaped bowl, now much broken, a short baluster-shaped stem, and a splay-foot. With these remains were found a number of Anglo-Saxon coins, from which the date of the deposit may be assigned to the year 878.—Mr. M H Bloxam communicated a paper on the ancient Roman station of Tripontium, which he contended had been misplaced, and which he identified with Cave's Inn, on the site of the Watling Street Road.

ZOOLOGICAL SOCIETY.

MARCH 16TH—Dr. A. Gunther, V.P, in the chair.—The Secretary read a Report on the additions made to the Menagerie during February, and called special attention to several novelties, amongst which were two female Thars (*Capra jemlaica*), mother and young, presented by H.R.H. the Prince of Wales on the 5th of February, and two Burrhel wild sheep (*Ovis Burrhel*), purchased Feb. 19th.—Mr. W. K. Parker exhibited and made remarks on the eggs and embryos of some crocodiles obtained in Ceylon by Dr. W. R. Kynsey.—Papers and letters were read: by Mr. W. A. Forbes, on some points in the anatomy of the Sumatran rhinoceros,—by Mr. E R. Alston, on a coloured drawing of an adolescent specimen of *Tapirus Dowi*, now in the Paris Museum (Mr. Alston also exhibited a specimen of a remarkable and little known Australian marsupial, *Antechinomys lanigera*, Gould),—from Mr. L. Taczanowski, on a collection of birds made in Northern Peru by Mr. Stolzmann during the last months of 1878 and the first half of 1879: amongst them were examples of three species believed to be new to science, and proposed to be called *Turdus maranonicus*, *Arremon nigriceps*, and *Colaptes Stolzmanni*,—by Mr. A. Craven, on three new species of land and fresh-water shells from Nossi-Be Island, north-west coast of Madagascar,—by Mr. Craven, on a collection of land and fresh-water shells made during a short expedition to the Usambara country, in Eastern Africa, with descriptions of seven new species,—by Mr. F. J. Bell, on certain statements made by Mr. A. Agassiz in a paper on the synonomy of the Echini, communicated to the Society at a previous meeting,—and by Mr. W. K. Parker, on the skull in the chameleons.

CHEMICAL SOCIETY.

MARCH 18TH.—Mr Warren De La Rue, President, in the chair.—Prof. Tidy read a lengthy paper "On River Water." He discussed the subject under three heads—1. Analytical details of river waters; 2. The various sources of impurity to which river water is subject, and the means whereby purity is maintained by nature or may be effected by art; 3. The extent to which statistics warrant us in condemning or in approving the supply of river water for drinking purposes. Under the first head the author gives detailed analyses of water from the Thames from 1876 to 1879. Analyses are also given of water from the rivers Nile, Severn, and Shannon. Under the second head is discussed the effect (1) of flood water, which at first deteriorates and then improves the quality of river water; (2) of peat, the quantity of which in a water is kept in check by, *a*, the inherent power that water possesses of self-purification, owing to the oxidation of the peat by the oxygen held in solution in the water; and, *b*, mechanical precipitation by admixture with coarse mineral matter suspended in the water; (3) of sewage matter This, in the opinion of the author, is a most vital question. From inspection of the effect produced by sewage on rivers, from analyses of the river waters, and from experiment, the author concludes that the oxidation of the organic matter of sewage takes place, when mixed with unpolluted water and allowed a certain flow, with extreme rapidity The various methods of artificial purification are discussed, of these filtration through sand is preferred. Under the third category the arguments for and against the use of river water for drinking purposes are examined. It is shown that the death rates of towns supplied by wells and of the supplied by rivers are practically alike, and that in London there is very little to choose as regards mortality between districts supplied with well water and those supplied by river water; and while admitting that, as a matter of sentiment, he would prefer well water, the author contends that there is no reason for supposing that the *materies morbi*, whether it exists as a germ or not, can resist oxidation, which is efficient in destroying other organic matter, as proved by chemical analysis. The author finally submits the two following conclusions—1. That when sewage is discharged into running water, provided the dilution with pure water be sufficient, the whole of it, after the run of a few miles, will be efficiently got rid of; 2. That facts indicate that, whatever may be the actual cause of certain diseases, the *materies morbi* which finds its way into the river is destroyed along with the organic impurity.

APRIL 1ST.—H. E. Roscoe, Esq., President, in the chair. The following papers were read:—"On Betorcinol and some of its Derivatives," by Messrs J Stenhouse and C. E. Groves. The authors have extracted from *Usnea barbata* an acid provisionally named barbatic acid, which is probably dimethylevernic acid; by distillation it furnishes carbonic acid and betorcinol (or β orcin); betorcinol melts at 163 C., and gives a bright crimson colour with hypochlorites. Its ammoniacal solution is rapidly coloured by exposure to air. Chlorine, bromine, and nitroso compounds were prepared and examined. "Note on Chemical Equilibrium," by Mr. M. M. P. Muir. The object of this paper is to describe a few measurements of the variations caused in chemical changes by modifications in the conditions of these changes, and to attempt to generalise some of the conditions of chemical equilibrium, looking at the phenomena from a dynamical point of view. "Preliminary Note on the Action of the New Diastase Eurotin on Starch, by Mr. R. W. Atkinson. The author has studied in detail the interesting manufacture of "saki," the fermented liquor from rice. He comes to the conclusion that the ferment solution "koji" converts the starch of rice not into maltose and dextrin, but into glucose and dextrin. Analyses of the "mash" are given at various stages, from the first to the twenty-eighth day. "Note on the Products of the Combustion of Coal Gas," by Mr. L. T. Wright. In opposition to the paper recently read before the society by Mr. Ridout, the author concludes that ozone is not formed by the combustion of coal gas, and that the substance which gives the blue colour with iodide of potassium and starch is probably nitrous acid, as when the coal gas and air are carefully freed from ammonia no blue colour is produced "On Polysulphides of Sodium," by Mr. H. C. Jones. The author establishes the existence of the pentasulphide, which is probably a tetrathiosulphate—this is probably the highest sulphide; on heating it is converted into a tetrasulphide The precipitate produced by the addition of the pentasulphide to cadmium salts contains cadmium, sulphide, and sulphur. "On the Reflection from Copper and on the Colorimetric Estimation of Copper by means of the Reflection Cuprimeter," by Mr J Bayley.

PHOTOGRAPHIC SOCIETY.

MARCH 9TH.—J Glaisher, Esq., President, in the chair.—Papers were read: by the Rev H. Lansdell, "On a Tour round the World, *via* Siberia and California," illustrated by photographs,—and by Capt. Abney, "On the Lateral Spread of the Image during Alkaline Development," showing that a deposit took place in all directions, and thus overlapped the edges, causing blurring.

GEOGRAPHICAL SOCIETY

MARCH 8TH—Major-General Sir H. C Rawlinson, V.P, in the chair. The following gentlemen were elected Fellows:—Earl of Charlemont, Captain W. E. Armit, Staff-Commander W. B. Goldsmith, Lieutenant J Hobday, Messrs. H. C W Becher, C. G Brown, H. A. Hammond, E. H. Man, J. Montefiore, H. J. Moxon, St John Stephen, A. A Ludwig Straube, and G. Venables. The papers read were "Latest News from the Society's East African Expedition," and "An Autumn and Winter Voyage along the Coasts of Norway and Lapland," by Lieutenant G. T. Temple.

GEOLOGICAL SOCIETY.

MARCH 24TH.—R Etheridge, Esq., President. in the chair. Messrs. H. T. Burls, J. A. M'Donald, and Rev. T E. Woodhouse were elected Fellows. The following communication was read.—"On the Newer Pliocene Period in England, Part I. Comprising the Red and Fluvio-Marine Crag and Glacial Formations," by Mr. S. V. Wood, jun.

ARCHÆOLOGICAL INSTITUTE.

APRIL 1ST.—C. S. Greaves, Esq, in the chair Mr. J. B. Davidson read an important paper on the Twelfth and Fifteenth Itinera of Antoninus, in which he ably dealt with the various treatises of his predecessors in the same field, from the industrious studies of the sixteenth century to the papers by Bishop Clifford and Mr. Gordon Hills. With reference to these latest productions, Mr. Davidson noticed that the authors put forward their views regardless of the successes or failures of all previous essayists and of the traditions of the matters at issue, notwithstanding that a consensus had actually been arrived at on the main features involved. He considered the numerous editions of the Iters, both English and foreign, the main object of his paper being to weigh the case fairly as it was considered by the men of old, the entire question being handled with exceeding minuteness and learning. Mr. Davidson dealt with the novel process of reasoning with which Mr. Gordon Hills had departed from the line of existing tradition as regards the Fifteenth Iter, and expressed his surprise that the military road to the south-west of Britain could, with any controlling power, have ended at such a distant post as Dorchester. Mr. Hill's position being based upon accurate measurements to suit the number of Roman miles was further contested by the fact that the abbreviation M.P.M., preceding the numerals, does not mean *millia passuum*, but *millia plus minus*, so that all accurate measurements with rule and compass are out of the question. Mr. Davidson's reading of M.P.M. was certainly supported, as was also his reading of the abbreviation "it" for *item* instead of *iter*, by ancient and other strong authorities. Mr. Hill's confident use of the longitudes of Ptolemy was also vigorously combated, and the author concluded his paper with a careful survey of the routes of the Iters in question. The chairman spoke in high terms of the labour that had been bestowed upon a most difficult and intricate subject, and, with regard to the, to himself, new rendering of M.P.M., doubted whether the Roman engineers would have measured a route, set up milestones, and recorded on them that the distances were uncertain. The Rev. E. P. Gibson read a paper "On the Parish Registers of Stock and Ramsden-Bellhouse, Essex," giving many curious and interesting extracts concerning collections on briefs, excommunications, fees, affidavits, &c. A discussion followed, in which it was incidentally stated that the long-lost parish registers of St. Alban's Abbey had been lately discovered in a loft. Among the objects exhibited were the following, lent by Mr. Masey, dug up in London Wall:—A remarkable Roman antique bronze, in shape not unlike a shovel, with a ring-handle, possibly part of the trappings of a curricle; Roman sandals of leather, with delicately worked straps; spindle whorls, keys, Samian ware with makers' names, and other Roman remains Programmes respecting a Special Exhibition in June, at the Rooms of the Institute, of Helmets and Mail were distributed.

ASIATIC SOCIETY.

MARCH 15TH.—Sir H. C. Rawlinson, President, in the chair.—Messrs. Robinson and Gibb were elected Resident, Major Trotter, R.E, and Messrs. Massey, Maxwell, Harvey, and Sauvaire, Non-Resident Members.—A paper was read, contributed by Capt. Durand, giving an account of his recent researches in the islands of Bahrein, in the Persian Gulf, where he had found the remains of a vast number of tombs, and possibly of temples, and a remarkable black stone, bearing a very early cuneiform inscription Sir H. Rawlinson called attention to the great value of these excavations, as throwing additional light on what has been already gained from the interpretation of the legends of Southern Babylonia. The Babylonians, he added, who were mainly instrumental in imparting civilization to Western Asia, admitted having received all their knowledge from the mysterious islanders of the Persian Gulf, agreeably with the tradition preserved by Berosus of Oannes, the Fish-God. The inscription on the black stone he translated, "The Palace of Rimugas, the servant of Mercury, of the tribe of Ogyr."

STATISTICAL SOCIETY.

March 16th.—Sir R. W. Rawson in the chair.—The following papers were read: "On Vital Statistics of Cavalry Horses," by Dr. T. G. Balfour,—and "A Survey of Indictable and Summary Jurisdiction Offences in England and Wales, from 1857 to 1878," by Prof. Leone Levi.

ENTOMOLOGICAL SOCIETY.

March 3rd.—H. T. Stainton, Esq., V.P., in the chair.—Dr. H. C. Lang and Mr. F. Crosbie were elected Ordinary Members.—Mr. Pascoe exhibited several species of scorpions, in reference to a statement recently made elsewhere that scorpions had been known to sting themselves to death when surrounded by fire. This Mr. Pascoe doubted, and showed that the two common European species, *Scorpio Europæus* and *Buthus occitanus*, were almost physically incapable of effecting such a purpose.—Mr. Stevens exhibited a dwarfed female specimen of *Plebeius Icarus* (*Lycæna Alexis*).—The Rev A. E. Eaton exhibited several plates of drawings of Ephemeridæ, part of a forthcoming work, and contributed remarks thereon.—The Secretary exhibited, on behalf of Mr. G. Francis, of Adelaide, the microscopical specimens referred to at the last meeting of the Society.—Mr. H. Vaughan exhibited a series of *Cidaria russata* from Yorkshire and the Isle of Arran in illustration of local variation of the species.—The Rev. H. S Gorham read a further communication on the Lampyridæ and also a paper giving the results of his observations on these insects with respect to their phosphorescence, which he believed to be due to sexual causes. With regard to the typical species of the family, he observed that in the most highly organised genera, such as Lanprocera and Cladodes, the light-omitting faculty did not appear to be developed in proportion with the rest of the organs, and that the eyes were also reduced "in a direct ratio with the light," being small and uniform in both sexes, "whilst the antennæ were developed in an inverse ratio as the phosphorescence diminished."—Mr. C. M Wakefield communicated a paper, by Mr. R W. Fereday, entitled "Description of New Species of the Fam. Lucanidæ and the Genus Chlenius."—The following papers were also communicated: "On Synonyms of Heterocerous Lepidoptera," by Mr. Butler, and "Descriptions of Cetoniidæ and Cerambycedæ from Madagascar," by Mr. Waterhouse.

MATHEMATICAL SOCIETY.

March 11th.—C. W. Merrifield, Esq., President, in the chair.—Mr. W J. C. Sharp was admitted into the Society, and the following gentlemen were elected members: Prof. Seitz, Messrs. C. S. Peirce, E. M'Clintock, and E. Temperley.—The following communications were made: "Notes on a General Method of Solving Partial Differential Equations of the First Order, with several Dependent Variables," by Mr. Tanner,—"Note on the Integral Solution of $x^2-2Py^2=-Z^2$ or $\pm 2Z^2$ in certain Cases," by Mr. S. Roberts,—and "Notes (1) on a Geometrical Form of Landen's Theorem with regard to a Hyperbolic Arc; (2) on a Class of Closed Ovals, whose Arcs possess the same Property as Two Fagnanian Arcs of an Ellipse," by Mr. J Griffiths.

PHYSICAL SOCIETY.

March 14th.—Dr. Huggins in the chair.—Prof. Hughes, Prof. Minchin, Messrs. Hulme, Stroh, Wingfield, Macfarlane, and Gray were elected Members.—Mr W. C. Roberts read a paper "On the Flashing which attends Solidification of Cupelled Buttons of Gold and Silver."—Prof. Barrett described his observation that electricity is generated by the friction of the contact rod or stylus on the chalk cylinder of the Edison telephone, and suggested that this fact explains the true action of the receiver of that telephone, which is usually attributed to electrolysis of the solution in the chalk.—Mr. S. Bidwell made a number of experiments controverting Prof. Barrett's suggestion, and showing that the electricity generated was due to electrolysis.—Dr. Guthrie showed that while flannel rubbed with ebonite is + electrified, and ebonite rubbed with glass is +, flannel rubbed with glass instead of being still more positive is feebly −.—A note was then read in which Mr. Ridout stated that he had succeeded in attracting a cone of glass into the mouth of a funnel through which a stream of water flowed, the angle of the cone being greater than that of the funnel.

NUMISMATIC SOCIETY.

March 18th.—J. Evans, Esq., D C.L President, in the chair.—Messrs. G. W. E. Bieber, J. W Trist, and A. W. Young were elected Members.—The Rev Canon Pownall exhibited and communicated some notes on the following coins: 1. A base shilling of James I., countermarked as a siege piece of Kilkenny; 2. A sixpence of Queen Elizabeth, 1564, countermarked with the arms of Zealand; 3 A testoon of Edward VI., countermarked in the reign of Elizabeth with a portcullis before the face of the king, and ordered to pass for fourpence-halfpenny; 4. A penny of Stephen, from the collection of Mr. Young, of Leicester, struck at the Nottingham mint, and countermarked with a cross sufficiently large to deface the king's image, and thus to convert it into money of the Empress Matilda.—Dr. Pauli exhibited a paper coin, 1574, struck from church Bibles during the seige of Leyden, also a large silver medal, struck to commemorate the sitting of the Synod of Dordrecht in 1619, and other coins.—Mr. B. V. Head read the first portion of a paper "On the Chronological Sequence of the Autonomous Coins of Ephesus," in which he brought down the history of Ephesus from the earliest times to the end of the fifth century B.C.

DANGERS OF FIRE FROM STEAM PIPES.

Wm J. Baldwin, of Elmira, N. Y., writing to the *Scientific American* on the above subject, gives the results of the following experiments, premising that it would be well to define the difference between seasoned wood, charred wood, and charcoal.

The first admits of no degree; it is simply wood with the sap and the excess of moisture, above what would be incidental to the hygrometric state of the atmosphere.

The second admits of degree, and is wood with the hydrocarbons partly driven off, according to the completeness of the charring.

The third admits of no degree, and is nearly pure carbon and ashes.

I enclosed a two inch cube of white pine wood within a small gas pipe retort, with a bit of solder (one-third tin and two-thirds lead) and a bit of sheet lead, and placed the retort in a boiler tube for five days, boiler going day and night At the end of that time the wood was pure charcoal, the solder was melted, and the lead was not, which goes to show pure charcoal can be made at a temperature between 500° and 612° F.

To prove the above was pure charcoal, *i.e.*, that all the hydrocarbon was driven off, I raised the temperature of the retort to about 1,000°, but could not drive off any more gas.

In October, 1877, I enclosed pine laths against the shell of a horizontal boiler, and covered them with a course of brick on edge. The pressure of steam in this boiler has been 40 to 60 lb. day and night since, except one day a month for cleaning. The ends of the laths that came out to the air and flush with the brickwork are not near as dark as hemlock tanned leather, and the darkest part I could find which was entirely covered with brick is not as dark as roasted coffee. This goes to show charcoal cannot be made at 300° F., after two and a half years, under the most favourable circumstances, with a furnace fire only five feet beneath it.

To prove this wood was not charcoal, I placed it in a retort and drove off gas that burned with nearly as much light as illuminating gas, when it leaves the retort.

In experiments on the ignition of charcoal, I found that the charcoal made in the boiler tube would not redden at the melting point of lead (612° F.), but would at a lower temperature than zinc (770° F.).

My mode of operation was this way I passed a gas pipe through a fire and blew pure air through the pipe. I also prepared myself with long slender strips of solder (half and half, and one-third tin and two-thirds lead), and with strips of lead and zinc, and pine shavings, and small pieces of the laths and charcoal.

The pure charcoal would not redden in the same blast that just melted the lead, but did in a blast which melted it rapidly. When held in a blast which melted solder (one-third tin and two-thirds lead, melting temperature about 500° F.), it showed no signs of fire or redness.

The lath, which was two years and a half in contact with the boiler under a course of brick, would become charcoal in a temperature which melted half and half solder, but would not get a spark on it until I increased the temperature to where the needle of lead bent and dropped. The same with a nicely prepared splinter of white pine, in which I could see no deviation in the action from the splinter of the lath; they all became charred in the blast which melted half and half solder, but would not take on a spark until the lead melted

With a blast that fused a metal 19 parts tin, 31 lead, and 50 bismuth, melting temperature about 212° F. I could not turn tissue paper brown.

Gunpowder held in the blast which melted the lead did not explode until after the lead melted. It gave off a slight blue sulphurous light first, then the lead melted, and an instant after the powder exploded.

The statement I made in my first letter I now repeat, "that the temperature at which wood and charcoal fire is between 500° and 700° F.," and that the purer the charcoal the higher the temperature required.

Illuminating gas will not take fire from a cherry red poker, but will from a bright red one.

The gas of wood, crude petroleum, soft coal, or any other hydrocarbon, will not take fire when escaping hot from the retort. With a cherry red poker I have tried the three mentioned.

I now wish to say that it was not my intention to make any of the readers of your journal careless in construction, and I would be sorry should my remarks, in answer to Mr. Smith's letter, be the cause of loss to any of them.

I know insurance companies act on the principle that "prevention is better than cure," and that the results in many cases justify their acts few will deny; but questions of fact must be answered yes or no, and not by the *modus vivandi* of the insurance agent.

I will comment on the points in Mr. Atkinson's letter as they occur, and then try to show where the real danger lies in the use of boilers and steam pipes.

Is it not more likely that the wood of the "open boiling keir" was darkened in colour by the oxide of iron from the nails than charred by the temperature of boiling water at atmospheric pressure, conducted through the length of the nails into the wood, and is not this *rusty* appearance often taken for charring?

The "fine charcoal" under some conditions might be classed with damp cotton, slack of soft coal, or lamp black; but while workmen are allowed to carry matches in their vest pockets, it would be safer to associate it with the matches, especially in the face of all the steam pipes that are packed in charcoal, and one in particular in California, where high pressure steam is carried 2600 feet into a mine packed in charcoal.

The steam pipe "through the sill" prepared it for fire by drying it, and the dropping of a match, the fire from a cigar, or the superheating of the steam by getting low water in the boiler, could start it into active combustion. The same remarks will apply to the floor beam.

"Oiled waste cotton or wool and greasy overalls" have taken fire from being locked in a tool chest, *without* the aid of a steam pipe.

I will now endeavour to show why any one, whether insured or not, should comply with the requirements of the underwriters with regard to steam pipes and boilers, especially the latter.

When a journeyman, working in New York city, I was sent to John Hecker's house, in great haste, to see what the matter was with the steam heating apparatus. As soon as I entered the hall door I "smelled a burned boiler," and when I reached the boiler room I saw one The generator was a sectional pipe boiler, and was red hot, with the pipes badly warped, and the fire still in the furnace. Upon investigation I found that the hair felt and canvas covering was charred through, the latter being as brown and crisp as burned leather for a distance of about fifteen feet, and beyond that, for about fifteen more, it showed signs of charring, lessening with the distance. It surprised me the house did not take fire, for, instead of having steam at a *maximum density* in the pipes, it was at first *superheated* (cause, very little water in the boiler), and as the pressure found vent through the burned boiler (as some of the tubes were burned through), it must have been red hot air or gas which filled the pipes, and nothing but the want of circulation prevented it from carrying the heat to the small uncovered pipes throughout the house.

This is not the only case that came under my notice The First National Bank of Pittsburg had nearly the same experience when the janitor, in the fall of the year, fired two horizontal multitubular boilers for three hours (8 a.m. till 11 a.m) before he discovered anything wrong. He then came to look for me, and did not find me till 1 p.m. The boilers were still hot, and the uncovered pipes near the boilers were turned true black, the same as if they had just left the welding furnace and cooled; but where they were covered, the composition did not fall off, it being one of the lime and asbestos mixtures Another case was a private house in Detroit, where the blow-off cock was opened maliciously, and the Chalmer-Spence covering was charred and destroyed, and had to be replaced on the boiler, and for about six feet beyond it on the main steam pipe.

I cite the above to show there is danger from superheated steampipes, and though the superheating of pipes is not an everyday occurrence, it is safe to say they are more frequent than boiler explosions.

The following, though not generally recognised, often cause fires:—

(1). The sudden closing of a damper on a fresh fire is apt to send flame or sparks through any cracks in the brickwork of a boiler

(2). A *back draught.* The explosion of carbonic oxide, which sometimes takes place when any one opens the furnace door and admits air, where a lazy fireman has heaped coal on a dirty fire, which partly decomposes the coal by the heat of the fuel already in, but does not produce complete combustion for the want of sufficient air.

(3). The leaving of *banked fires* over night, with doors open or partly open, and dampers shut or partly shut, which, under some conditions, make small explosions of gas or throw hot coals by the bursting of slate in the fire out through the door.

The raking out the remnant of a wood fire at quitting time, which, thought it be ever so well done, is attended with great danger from sparks.

The excessive heat from upright boilers, smoke pipes.

The taking fire of soot, of soft coal, or wood, which will never show itself, or never can assume active combustion, when the fire in the furnace is going, as the carbonic acid gas from one fire will not support a second in the smoke; but should the first fire be low or out, the air will pass rich in oxygen to the second, and redden it, thereby heating the smoke pipe.

MILK AND LIME WATER AS ANTI-DYSPEPTICS.

MILK and lime water are, it appears, now frequently prescribed by physicians in cases of dyspepsia and weakness of the stomach, and in some cases are said to prove very beneficial. Many persons who think good bread and milk a great luxury, frequently hesitate to eat it for the reason that the milk will not digest readily . sourness of stomach will often follow. But experience proves, says the *Journal of Materia Medica*, that lime water and milk are not only food and medicine at an early period of life, but also at a later, when, as in the case of infants, the functions of digestion and assimilation are feeble and easily perverted. A stomach taxed by gluttony, irritated by improper food, inflamed by alcohol, enfeebled by disease, or otherwise unfitted for its duties—as is shown by the various symptoms attendant upon indigestion, dyspepsia, diarrhœa, dysentery, and fever—will resume its work, and do it energetically, on an exclusive diet of bread and milk and lime water. A goblet of cow's milk may have four tablespoonsfuls of lime water added to it with good effect. The way to make lime water is simply to procure a few lumps of unslaked lime, put the lime in a stone jar, and add water until the lime is slaked and of about the consistence of thin cream; the lime settles, leaving the pure and clean lime water on the top.

TALKING MACHINE.

A MACHINE with which a remarkably close imitation of human speech can be produced has (says the *Times*, from which we quote) been brought to this country by the inventor, Herr Faber, and exhibited to the Physical Society and privately, for closer examination of its mechanism, to several well-known scientific men. It opens up an entirely different set of questions from those suggested by the performances of the phonograph, which merely reproduces sounds uttered by the human voice. This talking machine will give intelligible utterance, more or less distant according to the words, to the ideas of the operator. The machine is the product of the continuous labour and study of two members of the same family It was begun in 1815 by one Joseph Faber, and so far elaborated in 1841 that it was exhibited in that year to the King of Bavaria. The originator, dying, bequeathed the machine to his nephew, the present owner, also named Joseph Faber, who had been associated with him in its construction, and since it became his property Herr Faber has almost doubled its powers of articulation. The chief points of interest the machine has for the physicist, the physiologist, and, it may be added, for the philologist, lie in the results obtained from the ingenious contrivances by which the functions of the flexible and mobile organs of voice are performed. The principle features of the machine are, to begin with, the bellows, from which the air is driven with considerable but varying force by means of a pedal lever. The lever passes in an horizontal stream through a small chamber, which represents the human larynx, and in the same right line out through the mouth. The lips and tongue are of india-rubber, and the lower jaw is movable.

Below the laryngeal apparatus, and opening from the chamber in which it is contained, is another smaller chamber, about the size and shape of a lemon, from which a pipe curved upwards allows the air when driven through to escape. This supplies the place of the nose to the instrument, and when a valve is opened enables the sound of the letters m and n to be produced by the striking of the same keys with which the sounds of b or p are obtained. The larynx is, of course, the most complex part of the machine, and to Herr Faber is due the elaboration of this portion of the mechanism. Within a small oblong box a narrow and exceedingly thin strap of hippopotamus bone, strengthened by india-rubber on one side, produces by its vibrations the speaking tone, which may be called the fundamental sound to be subsequently modified. At the will of the operator the pitch can be raised or lowered, but not during the utterance of a word or sentence, so that in saying "Mariana," or "*Comment vous portez vous* ?" the machine talks French, German, Italian, or English) the key-note remains unaltered to the end. In front of the vocal chord, and within the laryngeal chamber, are stops or diaphragms, placed vertically, and rising and falling like the wards of a Chubb's lock, but different in that each stop is a complex machine in itself, having within, moved by a spring, another stop by means of which an orifice at the base is enlarged or diminished. Herr Faber has taken another liberty with nature, for besides placing the nose below the mouth, for the sake of convenience, he has placed the teeth in the larynx, or more strictly speaking, with one of these stops he gets a somewhat lisping "s" or the sound of "sh" from the machine. A small wind-mill like arrangement gives the rattle of the letter "r," and a thin iron band, notched in the lower rim in front, fitting outside the upper lip, descends to give the "f" or "v" sound. There are 14 keys by which sounds are controlled. Striking the first the sound of "a" in "father" is produced, the mouth remaining wide open; another key being struck the lower jaw rises and the sound of "o" in "bowl" is given a third key moves a lever which nearly closes the mouth, and the sound of "o" in movement is emitted. The other vowel sounds, and the consonants are produced by the use of the diaphragms, in the larynx with the mouth in the second or third positions.

RECENT AMERICAN AND FOREIGN PATENTS.

Mr. William Freeland, of Brooklyn, N.Y., has patented a simple, durable, and safe device for securing carriage traces to the whiffle-tree, especially adapted to light harness having slotted leather traces, and it consists in a slotted pin fitted with a spring blocking piece, which is normally projected by the spring to retain the trace, and when depressed closes within the pin and flush with its surface.

Mr. Enoch B. Norton, of Hartford, N.Y., has invented an apparatus for sprinkling Paris green liquid on plants attacked by in [illegible], the object whereof is to enable the liquid to be carried conveniently in a suitable vessel, and to permit the quantity of liquid delivered and the direction in which it is sprinkled to be promptly regulated by the operator.

Mr. Richard Young, of Brooklyn, N.Y., has invented a tool for ornamenting and finishing the surface of leather, which consists in a creaser or marker, such as is used for lining, and a roller for embossing and printing, the creaser being stationary, while the roller is fitted to revolve, so that in use a line or crease and a printed impression are produced at the same time. The tool is used in connection with a drum, hand jigger, or other machine of usual character for finishing leather.

A lamp base, made of glass or porcelain, provided with two rings adapted to fit on the body of the base, and having two handles, each of which is attached to both of the rings, has been patented by Mr Joseph Kintz, of West Meriden, Conn.

Mr. John F. Curtice, of Fort Wayne, Ind., has patented an improved device for heating sad irons upon the top of a stove. The invention consists in an improved sad iron heater formed of an open bottomed box divided into compartments by vertical partitions, having the middle part of its top stationary and provided with a handle, and the side parts of its top inclined and formed of doors shutting air tight, or nearly so, and provided with spring catches, to adapt the device for use in heating sad irons upon the top of an ordinary stove.

An improved road-scraper, patented by Mr. Samuel H Dudley, of Bantam Falls, Conn., consists in the combination of guard bars having their upper ends bent forward at right angles to fit into the notches in the upper edge of the plank, and having sockets formed in their lower parts to receive the rear ends of the draw rods, with the plank, the draw rods and the staples of a scraper.

Mr. Charles A. Gale, of Piqua, Ohio, has patented an improved apparatus for taking solar prints from negatives. The invention consists in the combination of the two frames, hinged to each other at one edge, and provided at the other edge with a bolt and hand nut or equivalent clamp.

Messrs. Cornelius Bennett and Parker Burnham, of Silver City, Territory of New Mexico, have patented an improved apparatus for separating gold and other metals from dirt and sediment by what is known as the "dry" process. The invention consists in a combination of devices which cannot be explained without engravings.

Mr. Nikolaus Kaiser, of Grellingen, Switzerland, has patented an improved mode of drying paper and pasteboard in continuous strips, and in the apparatus employed for that purpose. Heretofore the paper coming from the pressing machine, or other machines, was led over heated metal cylinders, which had the disadvantage that the paper became more or less brittle, thus rendering impossible the use of mechanically ground unboiled wood fibre without other admixture, and also that the cost of plant and working was considerably increased by the necessary employment and working of the expensive metal cylinders required for the purpose. This invention is designed to obviate these defects.

Mr. Frank H. Lauten, of New York city, has patented improvements in feeding paper and other material to printing presses and folding machines, the blanks to the forming and shaping machine for making paper boxes and bags, ruling machines, and for other similar machines wherein the paper or other material requires to be fed in single sheets continuously and in harmony with the operative mechanism of the machine. The improvements also comprehend devices for adjusting the paper on the apron.

An improved machine for cutting the corners of books, cards, and paper has been patented by Mr. William T. Pringle, of New York city. It is of very simple construction and well calculated for the work it is intended to perform.

Mr. Henry L. Russell, of Bloomington, Ill., has invented an indicator lock especially designed for fire alarm boxes, railroad switches, &c., where it may sometimes be desirable to know who unlocked it last, that must be opened with numbered keys, and will register the number of the key that last unlocked it

Messrs. Richard H. Briggs and James H Dougherty, of Whistler, Ala., have patented improved mechanism for making ladder irons and hand-holds for freight cars. The machine consists of an ingenious combination of devices which cannot be clearly described without engravings.

An improved cider press, patented by Mr. Gottlieb Ziegler, of Paris, Ohio, will press the juice from any quantity of pomace that may be required without changing the parts of the press It is also adapted to work more rapidly than the presses now in use.

An improved gate hinge is patented by Mr. James E. Davis, of Palmyra, Ohio. This hinge is designed for the class of gates that are opened by running them back and then swinging them around It consists in a gate hinge formed of a screw hinged to a pintle provided with a small pulley and placed within a large ring pulley.

Mr. Garritt M. Van Riper, of Bodie, Cal., has patented an improved band sawing machine for cross cutting The invention consists in a band saw working on pulleys that are fitted movably on vertical shafts, whereby the saw can be moved downward to cut from a log two blocks at once

An improved paper pulp screen, patented by Mr Benjamin F. Warren, of Cumberland Mills, Maine, is designed to pulsate the pulp in a simple and effective manner, and it may be adjusted to vary the pulsations as required.

An improved turbine water wheel has been patented by Mr. William B. Farrar, of Greensborough, N. C This invention has for its object to provide an improved turbine water wheel which shall be simple and inexpensive in construction but strong, durable, and capable of running at comparatively high [illegible] with moderate pressure or comparatively low head of water

Messrs. David H and Jerome H. Payne, of Troy, N. Y., have patented an improved pulley for suspending clothes line. The line with clothes hanging upon it can be easily pulled around without injury to the clothes.

Mr. James J. Dubois, of Springtown, N Y., has patented an improvement in wagon running gear, the object of which is to furnish wagon reaches constructed so that they may be screwed into the rear axle and the head block, and may be guarded from being worn by the forward wheels in cramping the wagon.

Mr. William Huey, of Cambridge, Md, has patented a machine for cutting blanks from a block of wood and simultaneously grooving it preparatory to bending it into form for making the rectangular sides of the box. The invention consists in the arrangement of a stationary horizontal knife bolted strongly to a bed frame, so that it cannot bend when under strain; an adjustable gauge plate with groove cutters arranged just in front of the knife and enough below its edge to give the proper thickness of blank, together with a reciprocating block carrier.

Mr. James A. Knetzer, Sr., of Fillmore, Ind., has patented an improvement in the class of wagon brakes in which the sliding brake bar is adjusted by a rock shaft hung on the [illegible] axle, and having on inner end an arm from which a rod extends forward to the brake bar. The improvement pertains to the construction of the lever which operates the rock shaft, and the construction and arrangement of the device which connects them.

A firm and easily applied device for fastening handles to axes and other tools, has been patented by Mr. Andy E. Tangen, of Bismarck, Dakota Ter. It consists in fastening the handle in the eye of the axe or tool by means of spring straps adapted to clasp the ends of the handle inserted in the eye, and a bolt inserted into the eye from the end opposite the handle, so as to engage the spring traps.

Mr. John Houck, of Tobyhanna Mills, Pa, has patented improvements in feeding mechanism for tubular cutter-heads used for turning broom handles, curtain rollers, umbrella handles, and other wooden articles of cylindrical form. Such machines have heretofore been fitted with feed rollers fixed at the front and back of the hollow mandrel to carry the sticks through, and in case of the sticks breaking, or when for any reason access was required to the mandrel, considerable time and labour were involved, as the rollers or the mandrel had to be removed from their bearings. The object of this invention is to fit the feed rollers so that access may be had to the cutter readily without disconnection of the parts.

A combined rule, square, and gauge for carpenter's use in framing, has been patented by Mr. Mahlon B. Cornell, of Philadelphia, Pa. The object of the invention is to furnish an implement adapted for carrying out all the purposes for which the ordinary square is used with greater facility, convenience, and accuracy.

Mr Lucius S. Edleblute, of Cincinnati, O., has patented an improvement in the class of metal wheel hubs in which the spoke tenons or butts are clamped between flanged collars, one of which is adjustable on the axle box to adapt it for convenient adjustment or removal. By the peculiar construction and arrangement of parts the inventor forms a very firm, strong, and durable hub, whose parts may be readily put together or taken apart, and which is adapted to carry a comparatively large supply of lubricant.

An improved vehicle axe, patented by Mr. James Connill, of Oconto, Wis., consists of an axle made of cast iron in a cylindrical form, and divided off at each end into compartments, in which are placed rollers in a circle, so as to form a bearing for the spindles which are inserted in the ends of the axle. The spindles are held in the axle by collars, which rest in one of the compartments between balls, which hold them steadily and prevent endwise motion without producing much friction.

Mr. Jacob Mollet, of Liberty, Mo., has patented an improved vise for holding saws while being filled, which is simple, convenient, and and so constructed that the whole of one side of a saw can be filled without moving the saw. It may be used for holding hand saws, crosscut saws, and circular saws with equal facility.

Mr. Alexander B. Campbell of Albion, Wis., has patented an improved harrow coupling, which forms a flexible connection between the several harrow bars. It consists in a harrow coupling formed of a clevis attached to a harrow bar, the upper shank of which clevis is lengthened and terminates in an eye, into which a bar hook attached to the forward part of the clevis of the following harrow bar passes.

An improved drilling machine has been patented by Messrs. Nicholas Remmel and Mathias Remmel, of Rewaskum, Wis., for operating drills for drilling holes in metal and also for holding augur bits and other tools for boring wood. It consists in a drill stock connected with a shaft rotated by a crank or band wheel and gearing and held in a stationary frame, and in a device for feeding the work to the drill by means of a table placed on a shaft held in vertical guides and connected by levers with a treadle.

Mr. Elias A. Wible, of Folsom, Cal., has patented an improved vehicle axle formed of a socketed tube and a wooden stick, in combination with an interposed layer of rubber. There is a hole leading through the axle to the shaft, and provided with a case, a cup, and a screw, for the purpose of lubrication.

Mr. Gustave Wedel, of San Francisco, Cal. has patented an improvement in the class of binders for folios, or a series of detached leaves; it consists of metal strips doubled longitudinally to form lips or clamping edges, between which the leaves are secured

Mr. John Kenmuir, of St. Joseph, Mo. has invented an improved twelve bells striker for clocks, the object of which is to furnish a clock for use in masonic lodges, which shall be so constructed that it may be made to strike twelve low bells whenever desired, which will strike at no other time.

Mr. William W. Mackey, of Galion, O., has patented an adjustable gauge for cutting bevels for mitre joints with a circular saw, and for cutting them on opposite ends of the moulding without changing the gauge. It consists of two gauges pivoted at one end to the sliding bed on the side next to the saw, and having the opposite ends pivoted to levers or arms having longitudinal slots, which are crossed and secured together and to the bed by a set screw passed through the slots at the junction. These arms are designed to be graduated so as to permit the gauges to be set readily at any desired angle to the saw.

Mr Richard Cotter, of Virginia City, Nev, has patented a machine for tarring flat and round wire ropes, which is so constructed as to coat the ropes thoroughly with tar, force the tar into the crevices of the ropes, remove the surplus tar, and prevent it from running down the ropes

Mr. Warren H. Guthrie, of Florence, N J, has patented an improved screwdriver having a jaw on each side of the blade, the two jaws being connected by a right and left thumbscrew passed through a slot in the blade, whereby the ends of the jaws can be moved to and from the blade, and thus adapted to clasp screw heads of various sizes.

Messrs. William F. Flanagin and Daniel A. Sager, of Pine Wood, Tenn., have patented an improved automatic let-off mechanism for looms, for letting off the yarn from the yarn beam at a uniform speed from the first to the last end of the warp, the speed of the yarn beam being increased in proportion to the decrease of the yarn on the beam

Mr. Ansel T. Green, of Minneapolis, Minn., has patented an improved belt stretcher. It consists in fixing gear wheels on the heads of the two long side screws of the stretcher, and in arranging two corresponding pinions on a crank rod in such a manner that when the pinions are thrown in gear with the gear wheels both screws will be worked simultaneously; and it further consists of a graduated clamp for the more accurate adjustment of the sides of the belt, of hinged screw sockets for the quicker attachment and removal of the stretcher, and of a thumbscrew nut of novel construction.

Messrs. Jabez C Terry and Herbert J. Terry, of Springfield, Mass., have patented an improved button lathe designed for turning buttons into finished shape from blanks previously prepared; and instead of operating upon the principle of a cutter formed to suit the pattern of button, it employs a single cutting tool, which, by a variety of adjustments, that may be effected either by hand or automatically, permits the button to be turned and finished according to any desired pattern.

The same inventors have also patented an arrangement of revolving gripes for holding the stock, which are held normally together by spring pressure, but have a treadle connection for separating or retracting them, and a cutter head revolving in a plane at right angles to the plane of revolution of the gripes, or parallel with the axis of the latter, which cutter head is combined also with a treadle connection for causing the cutter head to approach the axis of the gripes at the will of the operator.

Mr. Elijah Ware, of Omaha, Neb, has patented an improved spring power for watches and clocks. The object of this invention is to construct a spring power mechanical movement for use in watches and clocks, or for other purposes, where a small power is required, and to dispense with the train of gearing usually required. The inventor makes use of a spring attached to and coiled around a shaft that carries a loose and fast gear wheel, the spring being attached also to the loose gear, and the two wheels geared to a secondary shaft.

Mr. James A. Moore, of Kewanna, Ind., has invented a spring-propelled carriage, whose motive power is contained in a combination of coiled springs, levers, eccentrics, &c. These are so arranged upon a carriage as to be capable of exerting sufficient force after the springs are wound up to effect a long continued and economical propulsion of the carriage.

Improvements in pressing machines for printers, bookbinders, &c., have been patented by Mr. Joshua W. Jones, of Harrisburg, Pa. The object of this invention is to improve the construction of the machines for which letters patent Nos. 201,711 and 212,917 were granted to the same inventor June 11, 1878, and March 1, 1879, respectively, and which were illustrated in these columns some time since.

Mr Ebenezer R. Gay, of Dubuque, Iowa, has patented a relishing or tenon finishing machine for use on rails for doors, blinds, panels, or other woodwork having rails with tenons and a groove or rabbet for panels. In such work, when the groove is not as wide as tenon is thick, or does not have the same face as the tenon, a rib or projection is left, which has to be removed, and the improved machine is adapted for such operation

Mr. William Forshaw, of Chicago, Ill., has patented an improved platform for vehicles. The invention consists of a forked standard, whose lower end embraces the axle at its centre, while its head supports the bolster plate, and secured between the forks of the standard and projecting laterally therefrom in both directions, is a plate spring parallel with and above the axle, and connected at its ends with the axle by transverse elliptical springs that are secured to the axle near its shoulders; and it further consists of a device for supporting and a device for adjusting the elevation of the carriage pole.

Mr. Josephus T. Willis, of Mount Sterling, Ala., has patented a device for instantly detaching horses from vehicles It consists of levers, sleeves, pivoted trace hooks, and a helical spring arranged upon a whiffletree and operated by pulling upon the governing strap.

An improved book holder, patented by Mr. John L. Highbarger, of Sharpsburg, Md, is designed for holding books open for convenience of reading. The device is applied to the upper end of a book cover; and it consists mainly of three parts—a bar or roller, two hooks or clasps, and two bent pivoted fingers. The hooks and fingers are attached to the ends of the bar or roller and receive and tightly clamp the upper edges of the lids of the book, and are so attached to the bar that it is free to rotate. The pivoted fingers rotate with the roller, so that they may be turned into suitable position to enable them to hold the leaves of the book.

Mr. William Driscoll, of Brockville, Ontario, Canada, has patented a trap, which is an improvement upon the form of animal trap in which the weight of the animal is made to release the tilting platform and allow the animal to be precipitated into a tank of water, a barrel, or other receptacle placed beneath the trap. In this form of trap it has been a desideratum to secure a latch mechanism for locking the platform which is sufficiently sensitive to be tripped by small animals, like mice, as well as by rats or larger animals. This improvement aims at this result.

Mr. Henry L. Russell, of Bloomington, Ill., has invented an improved device for attachment to the leaders that conduct the rain water from the eavestroughs to the cisterns. It is so constructed as to adjust itself automatically to conduct the first water from the roof into the waste pipe and the succeeding water into the cistern, to prevent the coal dust and other dust that may settle upon the roof from being washed into the cistern.

A bucket for taking bees from the hives to arrange comb, for carrying them from one place to another, and for capturing bees in case of swarming on trees, has been patented by Gideon C. Finley and Sarah E. Finley, of Petersburg, Tenn The invention consists in a bucket for transporting and capturing bees, having openings for the entrance and exit of the bees, an apron before the entrance slide, and openings for ventilation. The bucket is so arranged that it can be pulled to the top of a long pole if desired.

A key board attachment for musical instruments, patented by Mr. Christopher C. Reynolds, of Kelseyville, Cal., is to be used in connection with prepared music sheets to play the instrument by turning a crank, or by attachment to any suitable motor.

Mr. James M. Thayer, of Randolph, Mass. has patented a cheap, simple, convenient, and effective buckle for ties for bags. The invention consists of a rectangular frame of metal, perforated on one side for attachment to a strap, the frame having pivoted within it a tongue with a bevelled serrated tip, and curved or rounded end bars for the strap to hold or engage against.

Messrs. Robinson Buckingham and Charles W. Poindexter, of Alto Pass, Ill,, have patented an improved packer, designed to facilitate the pressing into boxes or packages of fruits and vegetables— as, for instance, peaches, early apples, pears, plums, or other fruit that will stand pressure when packed, or green peas, string beans, sweet and Irish potatoes, tomatoes, and other vegetables. The machine used for that purpose presses the fruit or vegetables by the lid into the box or package, and admits the convenient and quick nailing of the lid while being held on the box.

Mr. William C. Beattie, of Taunton, Mass., has patented improvements in jewel cases and analogous articles; it consists in a stand or case, having a stationary bottom portion, a stationary and elevated top or cover, and two standards connecting the said top and bottom portion and forming a handle, in combination with one or more receptacles hinged upon the standards and folding horizontally between the stationary top and bottom portions.

A new key ring, which can be easily opened and locked securely, has been patented by Mr. Bryant H. Melendy, of Battle Creek, Mich. The invention consists of a flat ring, a part of which is straight and provided with a cut, thus forming two ends and permitting the ring to be bent sidewise for admitting the keys. One of the ends of the ring is provided with a small shoulder, and a clasp is pivoted to the other end, which clasp swings over the end with the shoulder and locks it.

An improvement in automatic car couplings has been patented by Mr. Orlo H. Drinkwater, of Cedar Point, Kan. It consists in a peculiar construction and arrangement of parts which cannot be clearly described without engravings.

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Fire-Places, Stoves and Ranges, Fenders and Fire-Irons.—W. R. Lake (com.), C. Quitmann (com.), J. Moore, D. and T. Robertson, R. Roberts.

Floorcloth, &c.—C. and F. Leake.

Flues, Smoke Shafts, and Chimneys, Chimney Pots and Cowls, Cleaning Chimneys and Flues. —J. Moore, W. R. Lake (com.)

Food for Animals, &c.—W. Griffiths.

Fuel (artificial).—H. C. Hill, I. Blackburn.

Furnaces and Fire-boxes, Supplying Furnaces with Fuel.—R. Stone and W. R. Lake (com.), C. Wigg, B. D. Healy, J. Moore, J. Turnpenny, C. Carr.

Furniture, Upholstery, Cabinetwork, &c.—N. Descourties, C. R. Gwyn, G. O'Brien, R. Hunt, H. J. Dalton, W. Dawes, J. Reilly.

Games and Exercises Billiards and Bagatelle Markers and Indicators for Games.—F. Hoyer, J. D. Macfarlane, J. Caffarey.

Garden Implements.—J. Deverill.

Gas, Gas-meters, Holders, and Retorts.—S. Pitt (com.), J. Livesey (com.), W. T. Sugg, W. W. Monk, M. Williams, J. Storer, C. Kesseler (com.).

Gas Burners.—S. Pitt (com.).

Gauges, Water-level Indicators, Indicating Depth, &c.—F. Ladry, S. and H. N. Bickerton and D. Orme.

Gloves, Gauntlets, Mittens.—O. McC. Chamberlain.

Goffering, &c.—W. R. Lake (com.).

Governors for Engines and Machinery.—H. J. Haddan (com.), J. T. Abell.

Grain and Seeds (Treating, &c.)—G. O'Brien, J. F. Stewart (com.).

Greenhouses, Hothouses, Conservatories, Forcing Pits, and Frames.—F. H. F. Engel (com.), W. G. Smith.

Grinding and Crushing Corn, Grain and Seeds, and Dressing Flour.—R. H. Hay, M. Benson (com.), L. Varicas (com.), J. F. Stewart (com.), W. B. Williamson.

Grinding, Crushing, Pulverising, and Disintegrating Miscellaneous Substances.—F. C. Knowles, G. E. Sherwin, M. Higgins.

Grinding and Polishing.—J. C. Ramsden.

Grinding and Sharpening.—J. C. Ramsden, W. R. Lake (com.).

Gutta Porcha.—E. Mourlot.

Hair and Bristles.—J. R. Meyer.

Hairdressing, &c.—W. R. Wise (com.).

Harness, Saddles, Curbs, Whips, Releasing from Harness, Grooming Horses, Nosebags.—R. Jones, F. Mills, L. Silverman, R. Rishton, J. W. Jones and E. R. Bridger, H. J. Allison (com.)

Hats, &c.—T. Forster and J. Leighton.

Heating, Warming, &c.—J. Wright.

Hoists, Cranes, Capstans, Windlasses, Raising, Lowering and Moving Heavy Bodies, Raising from Mines.—J. Hancox, W. C. Brown, T. Hodge, P. Kyle, J. W. Midgley.

Hoops, &c.—E. Hale.

Horse Shoes, Shoeing Horses, Shoes for Animals, &c.—O. Lampe.

Injectors, Ejectors.—C. M. Sombart (com.).

Inks, Inkstands, &c.—C. Kesseler (com.).

Inlarping, &c.—G. Hirst.

Ironing, &c.—A. B. Furlong.

Jars, &c.—W. R. Lake (com.), T. White.

Knitting, Tatting, Crocheting, &c.—L. Woodward, W. Brookes (com.).

Knives, Forks, Table Cutlery, Knife Cleaners. —W. M. Darwin, T. McGrah and C. M. Wood, H. Brandes.

Lace.—R. F. Carey.

Lamps, Lanterns, Chandeliers, Candlesticks, Lamp Furniture, Glasses and Shades, Lighting, Producing Light.—W. T. Sugg, T. Imray (com), S. Pitt (com.), A. Specht (com.), C. Quitmann, C. L. Clark and J. Leigh, J. J. W. Watson, T. Kennedy, E. Hennequinn and K. Callard. R. Phelps, J. M. Sim, R. Bourne, J. Lucas.

Leather, Skins, Hides, Artificial Leather and Parchment, Currying, Tanning, Cutting, and Ornamenting Leather.—W. R. Lake (com.).

Leggings, &c.—B. Birnbaum.

Life-buoys, Life Preservers, Rafts, Life-boats. W. Clark (com.).

Lime, &c.—R. Stone, B. W. Gerland (com.), J. P. Crump, J. W. and G. T. Raynes and P. Evans.

Locks, Latches, Bolts, Lock Furniture, Keys.—J. Merzbach (com.), H. Ferrer.

Manure; Treating Sewage.—B. W. Gerland (com.), H. J. Haddan (com.), J. Lesneur, P. Sponce, J. Deverill, M. Higgins, B. D. Healey, W. R. Lake (com.).

Matches, &c.—R. Bourne, W. R. Lake (com.).

Maps, &c.—J. Bell.

Mathematical Instruments.—W. F. Stanley, L. Appleton, J. T. Humphrey, H. Hensoldt.

Measures, &c.—L. Appleton, M. Graham.

Medicines, Drugs, &c.—J. Merrylees (com.), M. Gibbs (com.), T. Forster and J. Leighton.

Metal Waste.—W. R. Lake (com.).

Metallic Alloys.—G. A. Dick (com.).

Metals (annealing, &c.).—J. Sykes.

Metals (Casting, &c.)—J. Imray (com.), J. Sauvey and A. Patterson.

Metals, Cutting, Planing, &c.—J. P. Hawtrey, D. Embleton and P. A. Porter, W. R. Lake (com.), J. Barrow and J. Craven.

Metals (Forging, &c.)—A. Clifford, W. M. Zellan, H. J. Haddan (com.), W. R. Lake (com.), L. Richards.

Metals (Plating and Coating, &c.).—J. Wetter.

Metals (Smelting, Extracting and Reducing Metals, Heating Ores, Refining, Tempering, and Annealing Metals, Manufacture of Iron and Steel, Metallic Alloys, &c.)—R. Stone, C. Carr.

Mining, Boring and Blasting Rock, Raising from Mines, Getting Coals, Draining, Lighting, and Ventilating Mines.—B. J. B. Mills (com.).

Mixing, Kneading, Mashing, Stirring, Agitating, &c.—G. E. Sherwin, J. H. Johnson (com.).

Motive-power Machines, Obtaining Motive power.—J. W. Wardle, M. Cavalcrie E. Abbiati and G. M. Siccardi, J. Melling.

Mouldings, &c.—F. Walton.

Musical Instruments, Music, &c.—W. R. Lake (com.), A. Mills, C. Drake.

Nails, Spikes, Bolts, Rivets, Screws, &c.—W. R. Lake (com.).

Neckties, Scarfs, Bows, Cravats.—J. A. E. Sabatier.

Oiling or Lubricating, &c.—G. E. Vanghan (com.), J. A. and J. Hopkinson, E. Poole (com.), J. S. Saurey and A. Patterson.

Oils, Fatty Matters, Grease.—C. M. Warren, E. Poole (com.), G. Hugon.

Ornamenting, &c.—G. Hirst, G. L. Batonnier (com.), R. Boborts.

Ovens and Kilns.—J. P. Cramp, J. W. and G. T. Raynes and P. Evans.

Oxidation and Incrustation (Preventing and Removing).—E. Arnaud, J. Moulet and E. Ginoyer (com.).

Oysters.—W. R. Lake (com.).

Packing Pistons, &c.—J. Kirkman.

Packing, Storing, Baling, &c.—E. Hale, W. A. G. Schonheyder.

Paints, &c.—F. Walton, B. Dutkiewicz and A. E. Decouple.

Panels.—F. Walton.

Paper, Pasteboard, Papier Mache: Paper Hangings.—W. R. Lake (com.), J. H. Johnson (com.), R. Shackleton, A. M. Clark (com.), W. Morgan-Brown (com.), J. Robertson, J. Hird, W. R. Lake (com.), W. L. Wise (com.).

Pasting.—R. Shackleton.

Patterns, Designs, Models, &c.—T. Birbeck and G. E. Miller, D. A. Tasker.

Photography and Photographic Apparatus, Pictures Portraits, &c.—F. H. Warlich, E. A. Brydges (com.), B. de Dutkewiez and A. E. Decouple, W. P. Thompson (com.).

Pictures, Portraits, &c.—B. de Dutkewiez and A. E. Decouple, P. O'Halloran (com.).

Pins.—R. Bourne.

Pipes, Tubes, and Syphons: Joining Pipes.—J. P. Cramp, J. Robbins, W. R. Lake (com.).

Platforms.—C. D. Abel (com.).

Preserving and Preparing Articles of Food.—W. C. Marshall, A. Montoriol and P. P. Tarride, W. Clark (com.), H. Shaw and W. Spencer, H. Brandes, H. A. Dufrene (com.), T. F. Wilkins.

Presses, Compressing, &c.—W. Weldon.

Printing and Transferring: Type and other Surfaces for Printing, Composing, and Distributing Type.—F. Hoyer, R. F. Carey, C. D. Abel (com.), E. Rogers, P. O'Halloran.

Propelling Machinery, Transmitting Power, and Motion, Converting Movements.—W. Clark (com.), A. M. Clark (com.).

Propelling Ships, Propellers, Paddle-wheels and Screws.—W. H. Daniels, G. N. Caljolsky, A. Fildes, H. E. Newton (com.), A. M. Clark (com.), B. Hirsch.

Pumps, Pumping and Raising Water and other Liquids, Pumps, Pistons, and Packing.—A. W. Doery (com.), W. V. Ley, J. Miller, A. Grat, J. A. R. Hildebrandt (com.), G. H. Corliss, E. B. Ellington, J. N. Melling.

Punching or Perforating.—J. P. Hawtrey, W. R. Lake (com.).

Rags, &c.—W. A. Barlow (com.).

Railway, Permanent Way, Rail Joints, Chairs and Sleepers, Portable Railways, Atmospheric Railways, Switches, Points, Crossings, and Turn-tables.—J. B Carey, H. J. Haddan (com.), J. S. Williams, W. F. Reynolds, F. C. Glaser (com.), H. A. Fletcher, R. Hill and D. Marlor, L Richards.

Railways, Carriages, Coupling, Uncoupling, and Altering Position of Carriages and Engines.—J. W. T. E. and J. Hill, W. Harrison and D. Lomax, F. C. Glaser, W. R. Lake (com.), J. H Johnson (com.), T G. Massicks, E. Wilson.

Reaping, &c.—A. C. Bamlett, C. D. Abel (com.), C. A. Duvall and T. Hoskison, J. Harrison.

Reflectors, &c.—A. Specht (com.), R. Bourne.

Refrigerating, Cooling Liquids, Making Ices.—H. A. Dufrene (com.).

Registering, &c.—H J. Haddan (com.), F. Hoyer, H. E. Elliott, W. Chadburn, M. Graham, A. R. Burman and W. H. Gambell, L. Boye.

Roads, Paths, &c.—J. Deverill.

Ropes, &c.—J. A Boxer, C. Kesseler (com.).

Samples, &c.—A. J. Eli and P. Hargan.

Scents, &c.—H. F. Fellows, J. Betjemann.

Screens, &c.—C. H. Cousins.

Screws, Screw Drivers, &c.—W. S. Causer.

Sewing and embroidering.—T. McGrah and W. Brown, W. Clark (com.), H. G. Grant (com.), W. R. Lake (com.), R. Bourne, W.L. Wise (com.).

Ship and Boatbuilding.—P. A. Maignen (com.), W. R. Lake (com.), J. E. Atkinson (com.), J. A. Boxer, P. Clarke, H. E. Newton (com.), B. Hirsch.

Ships' Boats (lowering, &c.)—J. W. D. McEonald.

Ships (raising).—R. Punshon.

Sifting, Sorting, and Separating.—G. E. Sherwin, L. Varicas (com.), C. F. Cousins, J. F. Stewart.

Sign Plates, &c.—J. Budd.

Signals, Alarms, Communicating Apparatus, Conveying Sounds.—C. B. Sharp, W. R. Lake (com.), C. E. Spagnoletti, J. McNeice, A. and A. E. Gilbert, J. S. Williams, G. K. Winter, R. Hill and D. Marlow, T. Jenkins and W. Price, F. Ladry, A. A. Dupont (com.), L. and H. N. Bickerton and W. Orme.

Syphons.—T. J. Finch, F. Wirth (com.).

Sizing, &c.—W. Bywater.

Sluices, &c.—P. J. Martini and W. Muller.

Smoke (Preventing, &c.)—W. Turnpenny.

Sowing Seeds.—W. R. Lake (com.).

Spinning and Preparing for Spinning.—J. C. Ramsden, J. E. Wadsworth, T. Whitley, G. and W. H. Ingham, E. de Pass (com.), T. Guest and T. Brookes, J. King, J. H. Johnson (com.), J. J. Sachs, E. Sykes and W. Cliffe.

Springs.—T. Brown, J. H. Johnson (com.).

Stables, &c.—O. Grussen.

Stacking, &c.—J. Hancox.

Stamps (revenue), &c.—C. Kesseler (com.).

Stays.—E. P. Alexander (com.), F. C Nutter.

Steam and other Boilers, Cleaning and Preventing Incrustation of Boilers, Water Feeding Apparatus for Boilers.—E. Arnaud, J. Moulet and E. Ginoyer (com.), J. G. Wilson (com.), J. C. Mewburn (com.), W. R. Lake (com.).

Steam Engines (Stationary, Locomotive, and Marine).—H. J. Haddan (com.), A. W. Doery (com.), F. W. Durham, J. Imray, J. H. Johnson (com.), W. Apsey, J. C. Mewburn (com.), H. Thibault and T. Hawkins, J. D Churchill, W. R. Lake (com.), J. G. Wilson (com.), A. and J. Hopkinson, L. Boyce, G H. Corliss, E B. Ellington, A. Dobson, H. A. Bonneville (com.), J. T. Howson and J. Tate

Steering Ships, &c.—A. Lafargue, C. W. King and A. Cliff, S. B. Heathorn, H Hirsch.

Telegraphs; Telegraph Printing Apparatus.—W. R. Lake (com.), R. H. Courtenay, E. C. Bright, R. M. Lockwood and S. H. Bartlett, C H. Johnson.

Tilling and Cultivating, &c.—W. Sleep.

Tobacco and Snuff, Cigars, Cigar-Holders, Pipe and Cigar-lighters, Smoking Pipes, Tobacco Pouches, &c.—E. J. Kennedy

Tramways and Tramway Carriages, Tramway, Locomotives.—F. C. Glaser (com.), H. A. Fletcher.

Traps for Drains, &c.—A. M. Clark (com.), P. M. Justice (com.).

Umbrellas, Parasols, &c.—W E Palmer, H. Shaw and W. Spencer, J. Forster, A. M. Clarke (com.).

Upholstery.—J F. C. Farquhar, G. O'Brien, J. A Daniel and R. Whiteley J. Reilly.

Urinals.—J Smeaton.

Valves, Taps, Stop Cocks, Plugs, Regulating the Flow and Pressure of Fluids.—C. Pieper (com.), W V. Ley, F. W. Durham, C. W. King and A. Cliff, J. D. Churchill, J G. Wilson (com.), J. Smeaton, W. R. Lake (com), S Griffiths, C. Burgess, D Young, H. A. Bonneville (com).

Varnishes, &c.—C. Kesseler (com.), J. B. Freeman.

Velocipedes, Bicycles, &c.—J Dutton, C. Garrard, H. J. Haddan (com.), R Green, L. Hardaker, J. Barling, J. Lucas, M. H Gerling and R. E. Rumsey.

Ventilation Supplying and Purifying Air for Buildings, Mines, Ships, Carriages, &c.—J. Miller, J. O'Brien, T. H. Thompson, H P. Holt, J. W Melling.

Washing, Cleansing, and Wringing Fabrics, Yarns, and Materials.—W. Milward and B. Richards, A. J. Forbes, J. Wetter (com.).

Water-Closets, &c.—H. J Haddan (com.), W. R. Lake (com.), J. and F. Hubber, J. Smeaton, P. M. Justice (com.).

Weaving, Braiding, Plaiting, Preparing for Weaving.—P. Young and J. Matthieson, G Harling, R. Shackleton, P. and J. Banks and W. Slater, S. Quarmby, W. Morgan-Brown (com.), J. H. Johnson (com), W. Northrop, J. H. Brierley, J. Kippax, R. Greenwood and W. H. Hayhirst, T. Sagar, H Booth, W. Brookes (com.).

⁂ *The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.*

PAPER CLAY.

In view of the rapid rise in the price of paper, and the complaints of the paper makers with regard to the scarcity and increasing costliness of all sorts of paper stock, it is gratifying to see that one source of such raw material is not likely soon to fail us. Whatever may happen to rags, wood pulp, and the thousand other sorts of fibrous material supposed to enter into the composition of paper, the clay bank promises to be inexhaustible. True, the majority of people who pay a high price for paper may have a prejudice against that material, but evidently the owners of the clay banks have not; for in a prominent journal devoted to the paper trade, they boldly print a large cut of their "clay works," showing a long stretch of snowy bluff out of which a huge section has been cut, presumably to supply the needs of "all first-class mills, east and west," to whose owners they refer for evidence of the excellence of their clay.—*Scientific American.*

NEW WALL TENT AND STOVE.

A stove is often a necessity and always a desirable comfort in camp, for even in midsummer there are chilly mornings and evenings and rainy days, when the comfort of a little heat in the tent is greatly to be desired. All who have had experience in camping know that the proverbially unmanageable stove-pipe is most unmanageable in a tent. After ripping a hole in the tent, and getting the stove-pipe in place, it is no uncommon experience to replace it again and again, after the wind has detached it from the stove and caused it to tumble; and should the pipe be permanently attached to the stove, the matter is made even worse, as not only the pipe but the stove also must sooner or later come down. These difficulties are not by any means all that can be brought as objections to the ordinary camp stove and its accessories. It is a cumbersome addition to the equipage, and takes up a great deal of valuable room in a tent where there is very little room to spare.

The Hobbs tent frame and stove overcome the difficulties enumerated, and afford a compact, light, and efficient cooking and heating apparatus, well adapted to the wants of military men, sportsmen, surveyors, and engineers, for camp meetings, pleasure camps, and for all who dwell in tents during a portion of the year It is particularly well fitted for cooking, and its application to kitchen tents will not be among the least valuable of its uses.

The invention consists in substituting for the ordinary tent poles a frame composed of a ridge and hollow upright of galvanised sheet iron, and a wooden pole of the ordinary form.

The hollow upright, forming the stove-pipe as well as one of the supports of the tent, is of a special patented construction, securing great strength and rigidity, and at the same time being very light. It sets in from the end of the tent a sufficient distance to prevent injuring the canvas by heating, and its upper end is provided with a chimney cap or cowl, which projects over the canvas. Near the lower extremity of the hollow upright a stove is attached in such a way that it accompanies the tent in all its swaying motions. The stove is supported by an upright and a single hinged leg, and is readily and easily placed, and as readily detached and put aside when not in use.

This useful invention has been covered by two patents by Capt Charles W. Hobbs, of the U.S. Army. Mr. William A. Percy, of Plattsburg, Clinton county, N.Y., is agent and manufacturer. The inventor may be addressed in care of Mr. Percy.—*Scientific American.*

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

The organisation of the American Society of Mechanical Engineers was completed April 7, at a numerously attended meeting in the hall of Stevens' Institute, Hoboken. The society will embrace members, honorary members, associates, and juniors, and is open to mechanical, civil, military, naval, mining, and metallurgical engineers, and architects of practical attainments as designers, constructors, or teachers, if they apply for full membership. A junior must have been in practice for two years, or must be a graduate of an engineering school. The first regular annual meeting will be held in this city in November next. The election of officers resulted as follows:—President, R. H. Thurston, vice-presidents, H. R Worthington, Coleman Sellers, Eckley B. Coxe, General Q. A. Gillmore, U.S.A.; Wm. H. Shock, U.S.N.; Alex. L. Holley; managers, W. P. Trowbridge, Theo. N. Ely, J. C. Hoadley, Washington Jones, Wm. B. Cogswell, F. A. Pratt, Charles B. Richards, Wm. B Bement, S. B. Whiting; treasurer, Lycurgus B. Moore.

Reviews.

BAZALGETTE'S REPORT ON MAIN DRAINAGE OUTFALLS.

"Thames Conservancy and Main Drainage Outfalls." Report by Sir J. W Bazalgette, C.B., on the "Arbitration between the Metropolitan Board of Works and the Conservators of the Thames." London · Judd & Co.

This pamphlet contains Sir J. W. Bazalgette's report on the above subject, in full; it is of a very exhaustive and informatory character. The following extract from its concluding pages will enable our readers to understand the gist of the matter:—

The Report of the Arbitrators, which the Umpire has endorsed thus, concludes:—"The Barking and Halfway Reaches, where three banks are situated, are now *better for navigation than they were before the Outfalls* were opened,—that is to say, vessels of greater tonnage and greater draft of water can now steam up or down, or can now be towed up or down, the river than the vessels which could pass in these manners before the dredging was executed, but at times, viz, near low water, sailing vessels of a certain draught of water cannot make as long "boards" when tacking to beat up or down the river as they could before the banks came into existence. In this limited sense only do we determine the banks to be obstructions to navigation.

"That each of the three banks has arisen from the dredging operations in Barking and Halfway Reaches carried on by the Conservators of the Thames, or sanctioned by them, such dredging operations having removed material and having increased the sectional area of the river and altered the direction of the flow of the currents and tide so as to produce a diminished velocity in those parts of the Reaches where the banks are situated, thereby causing a deposition of matter suspended in the river and the formation of the three banks.

"That the water in the tidal portion of the Thames contains a considerable amount of suspended matter, derived partly from the basins of the Thames and its tributaries, partly from the washing away of the foreshores of the tidal estuary, where unprotected, partly from material brought up from the mouth of the river by the flood tide, partly from sand and mud stirred up in the course of dredging operations, partly from denudation of the river bed, partly from sewers in districts outside the metropolitan area, and partly from the sewers of the Metropolitan Board.

"The proportion contributed from this latter source is small as compared with the total amount of suspended matter in the whole volume of tidal water which flows past the outfalls on every tide.

"That the three banks are composed of matter which had been held in suspension in the water, and had been derived from the several sources above mentioned. Whilst, therefore, the sewage from the metropolitan outfalls may have contributed to their contents, the three banks cannot be said, in the sense of the Act of 1870, to have arisen from the flow of sewage at the outfalls, and we are therefore of opinion that the Metropolitan Board of Works should not be called on to remove, or contribute any portion of the expense of removing, the three banks or any of them."

The inquiry has been an exhaustive one, and the decision of the arbitrators is unanimous and so decisive in its terms that it may be said, for the next generation at any rate, to have set at rest the agitation which has been so needlessly fermented during the last ten or twelve years.

The effect of the award, therefore, has been to save a useless expenditure of public money in dredging away mud banks actually caused by such dredging, and liable to more rapid accumulations of mud in proportion as the dredging was increased. The misconception of the Conservators as to the nature and real cause of these accumulations, had it not thus been clearly and authoritatively explained, must have resulted in the ultimate removal of the outfalls to sea at an expenditure of millions.

The inquiry was narrowed, doubtless under the advice of the Conservators' counsel, to the formation of the banks near to the outfalls, because they saw that sufficient evidence could not be produced to justify the smallest hope of a decision in favour of the more wild and groundless statements that the banks above and below the outfalls were formed by sewage deposits from them, or that the water in the river is polluted by them to such an extent that it can be called a nuisance, or is even perceptible to the senses.

"Brook's Popular Botany," No. 1.—This is the first number of a new serial devoted to botanical subjects. It is illustrated with coloured plates, and appears to be a very useful work. The publishers are J. A. Brook & Co., 282, Strand, W.C.

"Night and Day."—This interesting record of the philanthropic works which are under the guidance of Dr. Barnardo still continues to sustain its well merited position

Postponement.—We are compelled to postpone our review of "Studies from the Morphological Laboratory in the University of Cambridge." Edited by F. M. Balfour, M.A, F.R S.

SONNET

On viewing the Picture of "Cleopatra's Deadly Resolve in the Temple of Isis," by Madame de Steiger.

In Isis' Temple sits the mighty Queen
Draped in a gown of gossamer and gold;
Thro' which her lovely form, fair to behold,
Peers; sweet as peers the moon thro' silver sheen,
When misty vapours veil the fairy scene.
But o'er her brow some mystery seems to fold,
And in her eyes her future fate foretold;
With anger burning, passionate her mien!
Her dreams of death, of Antony, and all
The splendour of the past! her glory gone,
And throne a wreck, where monarchs feigned to fall;
Her chiefs and army lost, her power undone!
Seized with despair she deigns not God to call,
In misery seeks a death her legions shun.

Henry George Hellon.

A simple device for stretching carpets on the floor, patented by Mr. John B. Eddy, of Stevens Point, Wis., consists of a T-head, with claws for taking hold of the carpet, attached to a ratchet bar spliced to another bar carrying a lever, with which the first bar is moved out from the other, and a pawl or dog which engages the ratchet and retains the bar in the position into which it is moved by the lever.

A wash bench susceptible of being raised in height, and of being compactly folded, has been patented by Mr. Abram Severson, of Auburn, N.Y. It consists of a tripod, two of the legs whereof are fixed to the head and provided with casters, while the third is pivoted in the head, and can be folded around near the other two.

PRITCHETT'S PATENT ECONOMIC WARMING APPARATUS.

It will readily be allowed by all who are familiar with the plans and processes which are now in general use for obtaining heat by means of the various hot water apparatus, that many as are their excellences they are open to various objections, both on the score of expense and also the space that is occupied by the hot water pipes and furnaces. The strength and durability that are deemed essential to both demand an outlay on pipes and furnace arrangements, &c., which necessarily involves large expense and considerable waste of heating power. The object of the inventor of the present apparatus has been to furnish that which may obviate these difficulties, and give a practical illustration of the fact that a large volume of air may be warmed with a very small expenditure of fuel. The apparatus consists of a series of receptacles, or cases, for water. The cases themselves may be formed of ordinary plates of corrugated metal, strongly put together, but having a small interval between them so as to unroll the water, as it were, into a film, and form a succession of reservoirs of water, about 30 inches in height, more or less, as is required, but only from ½ inch to one inch in thickness; enabling them, therefore, to be placed continuously, or as a series of panels, round any room or building intended to be warmed, and occupying scarcely any appreciable portion of the space of the room or building.

The corrugated form given to these reservoirs not only increases the area of the external surfaces, back and front, and imparts strength to the vessels, but secures a certain amount of friction in the action of the warmed water within the vessels which predisposes it to part with its heat during its circulation. The readiness with which that heat is so parted with is proved by experience, which shows that the sinuosities of the current of warm water, impinging upon the inside of the cases, greatly tend to the convection of its heat in the course of its circulation by radiation from off the corrugated surfaces from which it is emitted in all directions. Another marked peculiarity of the apparatus is observed when the water is warmed by the application of common gas; an ordinary burner, consuming about 5 feet of gas per hour, may be employed, but its whole power of producing heat is utilised by the admixture of atmospheric air with the gas before it is ignited, whereby the heating power of the gas jet is rendered as effective as would be that of several similar jets applied as open burners.

Another part of the plan in which the apparatus is formed embraces the admission of the external air through the centres of the receptacles or cases when formed into tubes, thereby securing the important result of keeping the breathing air of the apartment in a state fit for respiration, while it is maintained at a temperature sufficient for comfort. It need hardly be added how greatly this arrangement may be made to conduce to the comfort of invalids, or to the use of the apparatus in the sick wards of hospitals.

As an accompaniment of the above arrangement a plan is also employed technically called an "exhaust case," by which the air of the apartment already exhausted by use is removed in proportion as the fresh outer air is admitted. Thus far the use of gas jets, or any other ordinary mode of heating, has been pre-supposed for the warming the water in a small boiler which maintains the circulation of the small quantity of water which is employed, but should it be so preferred the apparatus can be brought into operation by means of an ordinary fire; in this case, a little reservoir, or kettle, will be supplied and fitted into a fire-place, or it may be even so arranged that a vessel connected with the flow and return pipes which maintain the circulation of the water, can be placed upon an open fire, and removed at will. The apparatus can be brought into use by being connected with the circulation from a kitchen boiler. By such means no extra fuel is required. But perhaps the most valuable feature of this invention consists in its adaptability to almost every situation in which gentle and continuous warmth is required. The little space that is occupied by the reservoirs, or cases, mere panellings of rooms; the ease with which the supply pipes can be laid from another chamber, so that no burner may be necessary in the room itself; the extreme simplicity of the apparatus, avoiding the cumbrous and heavy arrangements employed in hot water circulation of the ordinary kind tend to recommend the plans of this inventor as likely to be of much use where more pretentious plans are from any cause unavailable.

It cannot be doubted that there are many apartments in which the comfort of a genial warmth to be procured by the simple patent appliances mentioned will make them abodes of health and happiness, whose inmates may be very thankful for a plan which at a very moderate expenditure places such a blessing within their reach, and enables them to obtain a constant change of the air in their apartments without in the winter time lowering their temperature. Fires in rooms may ever be dispensed with, thus greatly diminishing household cares and expenses. The Patentee, Mr. Pritchett, F.R.I.B.A., of Bishops-Stortford, Herts, will give all particulars on be applied to.

THE FUTURE OF THE ELECTRIC RAILWAY.

It is now nearly forty years (says the *Scientific American*, from which we quote) since Professor Page's discoveries in electricity suggested to him the possibility of an electric railway; but in those days the costly galvanic battery was the only source of electricity available for such purposes, and his experimental electric locomotive was a practical failure. His power cost too much, and his machine laboured under the disadvantage of having to carry a considerable load of battery cells, the action of which was materially interfered with by the jarring and oscillation of the train when its speed approached three or four miles an hour.

The development of dynamo-electric machines during recent years has so lessened the cost of electricity as a motive power as to remove the most serious obstacle to the success of Professor Page's experiments. During the same time the transmission of powerful currents of cheaply generated electricity, through conductors of considerable length, and the reconversion of such currents into working force by economical motors, have become a matter of every day occurrence. It is quite natural and appropriate therefore that the problem of electrical propulsion should again come to the front, this time with every prospect of a speedy solution.

The problem had so long been in abeyance that when Dr. Siemens set up his electrical merry-go-round in Berlin last year, most men were disposed to look upon him as the propounder of a radically novel idea, and the electric railway as the product of the latest speculative thought in this direction. And when Mr. Edison adopted the system for practical use not a few people thought that he had switched off from the line of practical work to play with a novel toy, the outcome purely of his experiments in electric lighting.

The electric railway, however, is not a plaything. It is a practical reality, though just now entering upon the stage of useful and economical development. It opens a field of invention and improvement as wide and profitable probably as was opened up by the first steam locomotive: and we have no doubt that during the next fifty years it may work as great changes in the processes and economies of life as steam railways have during the half century just past.

On the little electric railway set up by Dr. Siemens in Berlin, the locomotive obtained its power from a special electric conductor running between the car rails, the current being returned through the rails. Mr. Edison has simplified matters by throwing out the central cable as a needless expense. He makes the track itself the conductor, sending the current up one rail and down the other, the locomotive being operated by the current forming a circuit through it when proper connections are made.

For readers unfamiliar with electrical motors it may be necessary to say that the power for the running of the electric locomotive is generated by a stationary boiler and engine, and transformed into electricity by an electric generator at the central station. As was suggested by the elderly lady fearful of boiler explosions, the water is boiled at home, and that source of danger is removed from the list of traveller's risks. And as the efficiency of a stationary engine is several times greater than that of a locomotive engine, it is possible to convert the power of a stationary engine into electricity, transmit it to the locomotive upon the track, and there reconvert it into working force as economically as (if not much more economically than) power can be directly evolved by the combustion of coal in a locomotive furnace

In the present stage of his experimental apparatus, Mr. Edison claims that he can realise in his locomotive seventy per cent. of the power applied to the electrical generator. The track is spiked to ties, as in the construction of an ordinary railway, and the loss of electricity in transmission is not more than five per cent. even when the track is wet. If there is no error in these figures, and we see no reason to suspect them, the economy of the electric railway is established. Its apparent advantages over steam roads are numerous. In the first place, the locomotive is light, comparatively inexpensive, and does not require a fireman or a skilled engineer to run it. The lightness of the locomotive greatly relieves the track, which need not be nearly so strong and heavy for a given service The wheels of the locomotive can be given any desired traction upon the rails, so that a light engine can pull a train up grades which are entirely impracticable with the ordinary locomotive. The track may therefore follow any ordinary road; and when the road is used purely for freighting, as in conveying ores from mines, the road may run where other roads would be quite impracticable.

For city use the electric railway promises to be exceptionally useful, both for the conveyance of passengers, and for carrying packages. Cars propelled and governed by electricity might supersede horse cars on the surface roads; and, even if no cheaper, the sanitary advantages of the electric road, resulting from the disuse of horses, would be considerable. Indeed, it is not impossible that the city of the future may dispense with horses entirely for general trucking as well as for passenger traffic, the roadways being laid with numerous lines of flat rails transmitting the power required for propelling carriages of every sort. The absence of noise, dust, friction, and the inevitable filth attending the use of horses, promises in the new dynamo-electric period a wonderful mitigation of the present evils of city life. On the elevated roads the lighter electric engines would be comparatively noiseless, and, unlike steam locomotives, would not be constantly pouring into the air sparks, cinders, and other offensive products of combustion; and the same power which propelled the cars would light them.

But, without attempting to forecast the distant future, it is easy to foresee abundant immediate applications of the new silent, wholesome, and economical method of transmitting and applying energy. The mining regions of the West, as well as our Eastern coal mines, present unlimited opportunities for its employment in hauling ores out of the mines along the mountain ravines and over their precipitous sides. The experiment of ploughing by electricity transmitted from a central generator was tried last year with encouraging success. The same plant would answer for the operation of cultivators and harvesters; and with a light, movable railway track, the same power would suffice to do the heavy hauling incident to farm work; and one of the great advantages of electric carriage would be shown here, as elsewhere, in the facility with which it can be operated from a distance. The wagon, loaded or empty, would need no driver, and could be trusted alone to pursue an even course between stations. By means of suspended cable-tracks the roughest regions could thus be safely and economically traversed either by small passenger cars, mail bags, or freight carriers; and the constant flow of evenly distributed small loads along such a line would aggregate as large a tonnage as is now transported over solid and costly roads in long but widely separated trains.

We have already experienced in the telegraph and the telephone the advantages of electricity as a carrier of thoughts and sounds. Who can tell but, when its capacities as a carrier of men and things have been fully developed, the electric telegraph and the telephone will be eclipsed in scope and utility by the electric road? Its possibilities are infinite; and it is the disposition of the men of these days to crowd the possible in every direction.

A NEW MOTOR

One of the great wants of the day is a motor for small machinery, which shall avoid the danger and inconvenience of steam. This is accomplished in the Tom Thumb caloric engine, recently patented, which makes use of the expansive force of heated air alone. Its success is based on employing a comparatively low temperature—250° to 300° Fah.—producing a pressure of four to five pounds per square inch, and operating on a broad diaphragm piston of relatively short stroke The piston is formed of two circular metallic discs, having between them a flexible diaphragm composed of a layer of vulcanised gum elastic sheet, and over this externally a layer of canvas, which protects the gum and prevents it from yielding to pressure. A clamp ring attaches this diaphragm air-tight to the rim of a dish-shaped vessel, so as to allow of a motion in the piston to the extent of about one-third its diameter. This is the working cylinder, from which, it may be observed, the boring and fitting, as well as friction incident to the ordinary arrangement, are quite eliminated. The piston box forms the upper member of the machine, the connection of piston and crank being apparent in the engine. The central part, the heater, is a tight metallic box, the interior heating surface of which is greatly increased by numerous thin plates or ribs cast in connection with the bottom and rising almost to the top nearly the whole length. The heat being applied to the bottom of the box, the lower edges of these ribs are virtually in the fire, and thus the whole are readily kept at a suitable temperature.

At the bottom is another piston box similar to the first, but larger, and having its piston below, with a valve in it opening inwards. This is the air pump, and it is connected with one end of the heater by a pipe which has an automatic valve at the lower end, opening upwards. As this piston descends it fills the box with air, which in ascending is forced into the heater, and the valve in the pipe prevents its return. The other end of the heater is connected with the upper piston box or motor by a pipe always open, the two thus forming one chamber.

The operation of the machine is thus.—The heater being filled with expanding air the motor piston is forced upward, and just before it reaches the highest point a tappet on one of the cross head guides raises a lever, pivoted on the outer frame, which lever in rising forces open a valve in the bottom of the motor box, opening a communication with the outer air, and consequently the pressure subsides, allowing the piston to descend. Soon after the main crank passes the top centre two long cranks on the ends of the shaft, connected with the cross-head of the lower piston by slotted rods, suddenly collapse the air-pump, blowing out the hot air from the heater and motor box through the now open valve in the bottom of the latter, and supplying its place with fresh cold air. The motor piston now descending presses and closes the latter valve, and the fresh air is confined between it and the valve below the heater, to be at once expanded for another stroke. The action of the air-pump not being against any pressure, little power is consumed in it. Like all other caloric engines it is single acting, and the pulley serves also for a fly-wheel. The internal capacities of the air-pump and heater are equal, and about three times that of the motor vessel. This is important in order to obtain sufficient pressure at a temperature so low as not to injure the motor diaphragm—the gum being vulcanised to bear about 300° Fah. The simplicity and cheapness of construction of this machine will recommend it for a great variety of purposes. An engine suitable to propel a sewing machine is about twenty-five inches high by thirteen wide, and heated by an oil or gas stove. An engine forty-five inches high is a quarter horse-power, while the full horse-power is six feet high by three feet wide.

For further information address J. Jenkins, No. 3, South Tenth-street, Philadelphia, Pa.—*Scientific American.*

EXTENSIVE FILTERING.

The Holyoke (Mass.) correspondent of the *Paper Trade Journal* says that a filtering experiment on a large scale is about to be tried by a company in that city, to obtain pure water for washing purposes in the manufacture of paper. Quite near the mills is a piece of land lying lower than the canal, and this the company proposes to fill with water to the extent of about three acres. Pipes will conduct the water from the canal bank into a bed of gravel some eight feet in thickness, through which it will pass, and it is expected that the filtering and the subsequent standing of the water in the reservoir will purify it sufficiently. The water will be about ten feet deep on an average, and will be pumped from a point about midway between the surface and the bottom. The experiment is a new one, and will be watched with interest.

An improvement in cannon has been patented by Messrs. Patrick B. Brannon and Thomas B. Bunting, of New York city. The invention relates to improvements in breech-loading cannon, and particularly to the construction of the breech, the breech block or wedge, and the manner of loading and firing the gun.

CANADIAN WEATHER.

Mr. H. G. Vennor, of Montreal, whose boldness in weather predictions has brought him into such prominence, says that the extreme cold of Canada is almost always produced by a wind blowing from a point to the north of west. Such a wind is both cold and dry. Being dry, in passing along it imbibes moisture rapidly, causing cold. Being also cold, it quickly absorbs heat from the surface of the earth, and when this continues for several hours of any day, and toward sunset it becomes calm, we then usually have the lowest state of the thermometer. In Canada, these extremes of cold usually last about three days; the nor'-wester beginning about noon of one day, blowing fiercely for that afternoon, becoming almost calm in the evening—then a cold night. Next day the wind is not so high, but still from a north-westerly point. Again, toward sunset, there is a calm, with the thermometer more or less below zero. In the morning, it may be observed that the force of the cold is breaking. If the wind veers round to a point south of west, there will be a few flurries of snow, very threatening in appearance, but amounting to very little in reality, no snow storms of consequence coming from the west. If, on the other hand, the wind passes to the east, several hours of bitter cold may be expected, followed by a general snow storm lasting from twenty to thirty hours.

VENNOR'S WEATHER PROPHECIES.

Mr. Henry G. Vennor comes forward again with his direful prophecies of storms, heat, cold, &c. His letter is dated at Montreal, May 18, and in it he says:—"I believe that June will be an intensely hot month, on the whole, but the end of the present month, and probably 'the first of June,' will be fall-like with frosts again. July will be a terrible month for storms, with terms of intense heat, but another fall like relapse, with frosts, will in all likelihood occur a few days before the 20th. I fear the storms of thunder and hail will be of unusual severity during July. I must claim the verification of my prediction relative to 'a cold wave with frosts, over a large portion of the United States between the 10th and 15th of May.' The relapse toward the close of the present month will be more severe than that just past."

RECENT AMERICAN AND FOREIGN PATENTS.

Veneers made of paper have been used in place of wood veneers to a limited extent. That they have not come into general use is due chiefly to the fact that the oil applied to their grained face prevents the due adhesion of the glue or cement by which they are attached to any wood surface to be ornamented. Mr. Isaiah M. Clark, of Coldwater, Mich., has patented a new, simple, and economical process, producing a paper veneer having an oil grained surface, and which will adhere to any object as firmly as wood veneers.

Mr. D. W. Clark, of Tidioute, Pa., has recently taken a patent for an improvement in window sashes, which all housekeepers will regard with satisfaction. It consists of a very simple arrangement of the sash, by which it may be quickly removed for cleaning, glass setting, or other purposes, and as quickly restored. A dwelling house furnished with these sashes has a positively increased value, for the glass work may be kept in handsome condition with much less labour than heretofore. This is an invention that is needed in almost every household. Considering that it is applicable to every window in every house, it will be seen that the uses of the invention, even in a small town, are quite extensive.

Mr. Allen Cox, of Boston, Mass., has patented a sheet metal pan, made without rivets, wire, or solder, and having its ring secured to it without the use of rivet or solder. It has edges as strong and as durable as the ordinary wire edged pan, is of somewhat less weight, is more convenient, as its broad, flat edges afford a good hold in putting it in or out of an oven. It can be manufactured at a greatly reduced cost of material, time, and labour.

An improvement in library lamp fixtures, patented by Mr. Joseph Kintz, of West Meriden, Conn., consists in a novel construction of clamping rings for holding the shade, and in the manner of fitting the stops that arrest the movement of the lamp in raising it.

Mr. Henry B. Winslow, of Marblehead, Mass., has patented an improvement in apparatus for the manufacture of lampblack. It consists in a certain novel construction, whereby the use of water is dispensed with and the character of the production improved.

A self-locking hook, so constructed that the weight of traces or other tension strain will hold the hooks locked to prevent them from becoming accidentally unhooked, has been patented by Mr. Joel R. Haines, Mount Laurel, N.J. The invention consists in forming upon the shank of the hook a toothed head, a toothed collar placed upon the rounded shank of the hook to engage with the toothed head, and a loop or half link attached to the toothed collar to receive the trace or other article and serve as a guard to prevent the hook from becoming accidentally unhooked.

An improved type clamp, patented by Mr. William J. Adams, of Philadelphia, Pa., consists of four tongued and grooved flat metal bands, each bent at a right angle, so that when fitted together they form an adjustable rectangular frame that may be extended or contracted as required to fit a form of types.

A binding for oil cloths, so constructed as to confine and protect the edge of the oil-cloth while allowing the binding to be rolled into a coil, for convenience in handling, storage, transportation, and use has been patented by Mr. George S. Eaton, of Brooklyn, N.Y. The invention consists in a flexible metallic oil cloth binding, made with a thickened flanged edge to rest against the edge of the oil cloth, and at the same time allow the binding to be wound into a coil.

Messrs. Elias Leak, of Longton, and John Edwards, of Fenton, England, have patented an improved apparatus for supporting pottery ware in kilns and ovens. This invention relates to certain improvements in apparatus for supporting pottery ware in kilns and ovens while being baked, glazed, or otherwise fired, and has especial reference to the seggars in which the ware is placed and supported while in the kiln or oven.

Messrs. Amos A. Deuse and James Deuse, of Chester, Conn., have patented a die for forming double spiral grooves in bits or gimlets, consisting of the two halves having the longitudinal and slightly tapering grooves and diagonal cross-bars, one pair of the bars being smaller than the other.

A chop conveyer for millstones, patented by Messrs. James H. Ellis, Alexander Scott, and Eli S. Edmondson, of Goderich, Ontario, Canada, consists in a spiral conveyer fitted to revolve in a channel around the bedstone and below the level of the grinding surfaces, which carries the chop to a discharge spout; also, in the construction and manner of operating the conveyer.

Mr. Edward Barnard, of Rome, N.Y., has patented a quarter boot for horses, having a soft leather body with stiff pads on the quarters, and a stiffening sole strip, the whole adapted to be held in place by straps and buckles.

An improved lamp burner, patented by Mr. Orlando Merrill, of Courtland, Ala., is so constructed that wider and narrower wicks, and larger and smaller chimneys, may be used with the same burners.

Mr. Joseph Kintz, of West Meriden, Conn., has patented an improvement in extension chandeliers, which relates to the means for retaining the extension rod of a chandelier in any position, as drawn out to lengthen the chandelier, and for releasing it, so that the spring may act to draw up the rod. The inventor makes use of a slide rod having its surface grooved or ribbed concentrically and sliding in a collar that is fitted with loose sectional nuts or clamping blocks, which are enclosed within a bevelled cup or ring. The cup is moved in one direction by a spring to force the nuts inward and clamp the slide rod, and is fitted for movement by hand to release the nuts by means of a trigger placed in a convenient position operating through a sliding tube that is connected to the cup.

Messrs. Lewis B. White and Leonard Henderson, of Middleburg, N.C., have patented a smoke and dust arrester for railway cars, which consists in enclosing the trucks of the cars in a housing having doors at the ends, which housings communicate with a pipe extending through the entire train, through which the air and dust from the wheels is drawn by a fan located in the rear car. Smoke may be drawn from a hood located above the smoke stack of the locomotive by the same pipe.

An improved device for fastening an umbrella to the body of a person who is exposed to the rays of the sun during his work, has been patented by Mr. Thomas Mora, of Franklin, La. The invention consists of a tubular socket provided with side springs, and of a tube provided with a laterally projecting ring, both of which are buttoned or otherwise fastened to straps or bands that buckle about the body.

Mr. Hubert Child, of Wichita, Kan, has invented improvements in transparent signs. It consists in "cutting in" a transparent letter on glass by means of an opaque colour, and placing behind the glass a packing of broken glass contained between two independent panes of glass, so that when the light from the rear shines through the transparent letter the plane character of said letter is broken up and diversified by the crystals of glass, which may be of different colours to produce a very brilliant and tasteful design.

An improvement in gate latches, patented by Mr. Samuel B. Elzey, of Atlanta, Ga., consists in combining a pivoted latch carrying an arm, a sliding bar carrying an arm, and a spindle carrying an arm, so that the gate may be unlatched by turning the spindle.

Mr. William Lineham, of Chicago, Ill., has patented a device for automatically feeding the fluid for preventing incrustation into the boiler along with the feed water, when supplied by a pump or an injector. It consists of a reservoir for holding the fluid, from the bottom of which a siphon pipe leads to the pump barrel or injector at a point where the water is forced or drawn by suction into the boiler. The siphon pipe is supplied with a stopcock and check valve, to regulate the amount supplied and to prevent back pressure when pumping.

Mr. Joseph Kintz, of West Meriden, Conn., has patented an improved process for giving an ornamental surface or finish to iron castings, which process is as follows:—The casting is first rolled or tumbled in the usual manner, and polished on the portions of the surface that are to have a polish on the finished article, and then the casting is coated with copper or other metal by electroplating. It is next subjected to acid bath, for cleaning, and then buffed to render the surface smooth and bright. It is then boiled in a tin or other metallic solution. The solution will deposit evenly over the entire surface, and the polished portions will be left brilliant, thereby forming a fine contrast with the unpolished surface and giving a fine polish and effect. The polishing previous to the electroplating, and the buffing subsequent thereto, are essential steps in the process, and by the boiling in a metallic solution the desired colour and a bright clean finish are obtained without further labour.

A simple, convenient, and effective device for stretching wires along posts in the making wire fences, has been patented by Mr. Joshua Fowle, of Iowa City, Iowa. The invention consists of a clamp provided with devices for adjusting and holding it upon a post, and provided also with crank and crank-shaft for stretching and tightening the wire.

An improvement in the class of automatic car couplings in which a bar is employed as the connecting device in place of the link, and is made to engage with spring jaws or catches located within the draw heads, such jaws or catches being operated by levers and connecting rods for the purpose of withdrawing them from engagement with the bar when it is desired to uncouple, has been patented by Mr. James H. Henley, of Leadville, Col.

An improvement in the class of invalid beds having adaptation and attachments for elevation of the head and shoulder portion and for introduction of a bed pan beneath a removable section of the mattress, has been patented by Mr. Chambers M. Campbell, of Nashville, O.

A simple, durable, and easily actuated alarm attachment for doors has been patented by Mr. Charles F. West, of Philadelphia, Pa. The invention consists of a peculiar arrangement of lever, striker, and trigger that render the alarm especially durable and of easy operation.

A safety appliance for releasing horses has been patented by Mr. Benjamin F. Strange, of Corvallis, Montana Ter. This invention consists in a hitching appliance so connected with the horse's halter that the halter will be cut if the animal should become entangled in it.

Mr. Mortimer Shea, of Nashville, Tenn., has patented an improved device for attachment to gas meters, to guard against any adjustment of the meter that will cause gas to pass through without being registered, and to indicate to the inspector if there has been any attempt to tamper with the meter.

An improvement in window sashes, patented by Mr. Alphonse Friedrick, of Brooklyn, N.Y., relates to lead sashes, such as are used in illuminated or ornamental windows. As heretofore constructed such windows have been strengthened by iron rods placed at intervals diagonally across the lead frames, and secured thereto by small wires twisted round the bars and soldered to the lead cross strips. Such bars are unsightly. They disfigure the designs, and in large windows the lead sash between the bars is not protected. The object of this invention is to strengthen the lead sashes where required by metal wires, which will be soldered to and hid by the sash.

Mr. Orlo H. Drinkwater, of Cedar Point, Kan., has invented a car-coupling which consists mainly of a draw-bar having a hook or shoulder and a link or clasp, which is pivoted and adapted to receive and lock with the shoulder or hook of a draw-bar attached to the opposite car. The links or hinged clasps are held engaged with the respective draw-bars by means of a spring or other suitable devices, and may be opened to allow uncoupling by means of rods, levers, or other means. The hinged loop or clasp is held open by a spring catch until the latter is acted on automatically, thus causing it to release the clasp.

Mr. Max Rubin, of New York city, has patented a bottle stopper provided with a discharge spout, and so constructed that the spout may be covered and uncovered by closing and opening the stoppers.

An improved store counter has recently been patented by Mr. Henry H. Henderson, of New Glasgow, Nova Scotia. The invention relates to means for supporting the hinged covers of the sections; and it consists in two jointed bars or rods, one pivoted on the inside and the other provided with an eye that slides on a keeper attached to the under side of the cover, in combination with a notched cam on the inside of one end of the section, so that the pivoted rod catches behind the shoulder when the cover is opened and holds it firmly in position.

Mr John D. Richardson, jun., of Newport, R.I., has patented an improved electric call bell. The object of the invention is to permit the operation from the central station of any one bell in the circuit, whereby one station may be called without giving an alarm at any of the others.

An improved signalling apparatus for railroads has been patented by Messrs. Richard B Ireland, of Trenton, and William H. McDonald, of Newark, N.J. The object of this invention is to provide for operating a signal located at one point on a railroad from different places—say from two separate switches—in such manner that the signal shall be exhibited when either switch is open and until both are closed, or so long as the main line is not clear.

Mr. Hiram N. Wickes, of Grand Gorge, N.Y., has invented an improved car coupling that couples automatically without requiring any one to step in between the cars, the link being held in horizontal position, so as to secure its entrance into the opposite drawhead. The invention consists of a drawhead, with internal cavity having upwardly inclined rear portion and central guide rib, along which a centrally grooved roller is carried by the link.

Mr Albert Bonzon, of Santiago, Cuba, has patented a new attachment for the second-hand shaft of clock or watch works which will cause the second hand to beat seconds, and which is so arranged that these beatings of the second hand can be interrupted or started at any desired moment.

Mr William B Garoutte, of Republic, Mo., has invented a novel cotton and seed planting machine. This improvement relates to machines for forming a mould or ridge, dropping the seed along the ridge, and covering the seed.

Mr. William L. Dietz, of Schoharie, N.Y., has patented an improvement in scrapers and cultivators for broom corn, cotton, and other plants planted in rows and drills, so constructed that they may be readily guided to operate upon crooked rows, and may be conveniently turned at the ends of the rows.

Mr Joshua W Jones, of Harrisburg, Pa., has patented improved attachments for hydraulic presses, so constructed as to close the outlet valve automatically when the follower has been run back to a fixed point, and to sound an alarm when the desired pressure has been attained.

An improved harness pipe loop attachment for wax thread sewing machines, has been patented by Mr. David M Lewis, of Memphis, Tenn. The sewing of pipe loops by hand is slow and tedious work, and greatly increases the cost of the harness; but with this attachment it is said that such work will cost less and be stronger. It can be used on lower grades of harness, and will improve their looks and increase their market value.

An apparatus for illustrating the rules of perspective drawing, so that a teacher by its use can prove to his pupils the correctness of the diagrams made in accordance with the rules, has been patented by Mr. Frank O'Ryan, of New York city.

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Sir David Brewster, K.H., LL.D., F.R.S., &c., from the establishment of the Inventors' Institute, till his decease, February, 1868. Lord Richard Grosvenor, M.P.

President, SIR ANTONIO BRADY.

THE SESSION 1879—1880
Is Ended.

The Balance Sheet 1879-80 can now be inspected.

Subscriptions are payable to Mr. G. A. Stretton, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. Campin, Sec.

Proceedings of the Institute.

Members' Meeting.

On Thursday, 3rd June, Mr. A. J. Murray, Member of the Council of the Institute, in the Chair, Mr. G. E. Pritchett read his paper on "Important Improvements in Barometers and Thermometers," which he illustrated by reference to several models. The matter was fully discussed by gentlemen present, the chairman, Mr. Baker (from the eminent opticians Messrs. Steward), Mr. Engert, Mr. Greenfield, and others, expressing themselves in favourable terms. The Secretary, Mr. F. W. Campin, proposed a vote of thanks to Mr. Pritchett, which, being seconded by Mr. Greenfield, was carried unanimously; and with the usual complimentary acknowledgments to the chairman the proceedings terminated.

Executive Council.

On the 3rd June, after passing the minutes, and transacting some financial business, the Secretary reported that he had up to that time heard nothing further of Mr. Anderson's Patent Bill, but stated he would watch for it, and note its progress, and he was requested so to do.

[The Bill has since come to hand, and will be found set forth in detail in another column.]

Monthly Notices.

A German historico-economic work on the commercial policy of England during the sixteenth century, by Dr. Georg Schanz, Professor of Political economy at Erlangen, is in the press, and will be published next autumn. Dr. Schanz has investigated sources of information hitherto unexplored, and his work is looked for with much interest by German economists.

Prof. D. T. Ansted, whose death was announced as having taken place on the 13th of May, was born in London on the 5th of February, 1814; entered at St. John's College, Cambridge, in 1832. In 1836 he passed as thirty-second wrangler, and took his B.A. degree. Under Prof. Sedgwick he studied geology, and in 1838 he was elected F.G.S. In 1840 Mr. Ansted succeeded Prof. Phillips in the chair of Geology in King's College, and was elected an F.R.S. From 1846 Prof. Ansted devoted himself to the economic applications of geology, which he continued until his death.

Sir Henry Bessemer has been accorded the freedom of the City of London in a gold casket, in recognition of his valuable discoveries.

The Rev. J. M. Mello has in the *Transactions* of the Manchester Geological Society, Part III. Vol. XV., some interesting "Notes on the more Recent Discoveries in the Cresswell Caves." No fewer than nineteen species of mammalia have been discovered in them, and two human skulls.

Tables of Spirit Gravities, of an elaborate character, have been prepared by Dr. Stevenson, of Guy's, specially adapted for the use of those engaged in the analysis of alcoholic liquids, to be published in book form by Mr. Van Voorst.

An Electrical Indicator, which shows the exact speed of an engine placed at a distance, has been devised by Mr. H. B. Kempe, of the Telegraph Department. The arrangements are most simple and effective.

M. Mouchot's Heat Receiver.—Before the Académie des Sciences, on May 24th, M. Mouchot brought a notice of his inquiries into the "Industrial Utilisation of Solar Heat." He has been making his experiments at Algiers, and has improved his heat receiver, and since March a horizontal engine, without expansion or condensation; and has been actuated by the solar heat at the rate of 120 revolutions a minute, with a constant pressure of 3½ atmospheres, the disposable work being about 8 kilogrammes, with which he has actuated a pump.

The Earl of Worcester, of inventive memory, according to documents recently published in the State Papers, petitioned in February, 1654, for the Commonwealth under which he was imprisoned for his loyalty to the Crown, leave to come with his keeper to York House, Strand, alleging that his presence was necessary for a trial of his invention "to raise water in a 7-inch bore pipe by the strength of one man, for which people have hitherto used horses at vast expense." He was allowed to proceed under guard to York House, but after testing the invention he returned to his captivity.

Nickel in a Malleable Form has been produced by Dr. Fleitmaun, who has perfected a process of production. M. Troost has communicated a paper to the Société d'Encouragement pour l'Industrie Nationale on this subject. It has hitherto been impossible to obtain large pieces of nickel which can be rolled. The Fleitmaun process appears to have overcome this difficulty. A plate of nickel a tenth of an inch in thickness can now be welded to an iron plate by bringing both to a red heat, and then passing the compound sheet through rollers or bringing it under a hammer; the nickel covering may be reduced to only 1-2000th inch in thickness.—*Athenæum.*

Society of Arts.—The Council of this Society have awarded medals to the following gentlemen for papers read during the session which is just over:—Major-General H. Y. D. Scott, C.B., F.R.S., A. J. Ellis, F.R.S., John Spark, Henry B. Wheatley, F.S.A., W. Holman Hunt, Thomas Fletcher, F.C.S., John C. Morton, Prof. Heaton, F.C.S., Captain Abney, R.E., F.R.S.

It seems likely that Comet *b*, 1880 (discovered April 6th), will become visible again after its perihelion passage in July. On the 8th of May Major Tupman, at Blackheath, observed it pass almost centrally over a catalogued star of the eighth magnitude.

The Scientific Review

AND

SCIENTIFIC AND LITERARY REVIEW,

A RECORD OF PROGRESS IN

ARTS, INDUSTRY, AND MANUFACTURES.

INCORPORATING THE

JOURNAL OF THE INVENTORS' INSTITUTE.

JULY, 1880.

THE NEW PATENT LAW AMENDMENT BILL.

LAST month we gave utterance to some very stringent remarks on the impolicy and impropriety of the Government allowing our notoriously bad patent laws to remain unreformed, and we alluded to Mr. Anderson's Bill, which is now endorsed, not only by that gentleman, but by Mr. Alexander Brown, Mr. Hinde Palmer, and Mr. Broadhurst.

We are afraid there is no chance of the Bill passing this Session ; but as it proposes to effect a very important step in the right direction we now present it to the notice of our readers:—

1. The Act to come into operation on the first day of January one thousand eight hundred and eighty one.

2. Her Majesty may from time to time, by warrant under her sign manual, on the recommendation of the Lord Chancellor, appoint an officer to be called the Chief Commissioner of Patents for Inventions, and on the recommendation of the President of the Board of Trade two officers to be called respectively Second and Third Commissioners of Patents for Inventions; and these officers shall hold their offices during Her Majesty's pleasure.

3. The Treasury may fix the salary for these three Commissioners at such annual sums as it deems proper, but not exceeding, for the First Commissioner £1,500, Second Commissioner £1,200, and Third Commissioner £1,000; and the Treasury may also provide further moderately paid assistance as may be found necessary for carrying on the work of the office, but as far as possible continuing those now employed. All payments under this section to be out of moneys to be provided by Parliament.

4. It shall be the function of these three paid Commissioners to do all the duty hitherto performed by the unpaid Commissioners and the Law Officers, whose duties shall thereupon cease; to take over the establishment from them; and to manage all the business of the Patents for Inventions Office of the United Kingdom, and to perfect its organisation; more particularly in the matter of a library of records and registers, so indexed and arranged as to facilitate searches, and to be easily accessible to the public under such reasonable regulations and small fees as the Chief Commissioner with approval of the Lord Chancellor may from time to time prescribe.

5. Letters Patent for Inventions shall be granted for the period of twenty-one years from the date of application, subject to a payment at the end of the seventh, and at the end of the twelfth, and at the end of the seventeenth years respectively, as prescribed in the schedules appended to this Act; and the provisions of this section shall apply also and equally to inventions (including foreign inventions) that may have been previously patented abroad.

6. Letters Patent for Inventions granted prior to the commencement of this Act, and then in force, shall be exempted from the payments formerly prescribed at the end of the third year, and at the end of the seventh year, so far as these payments have not become due at the commencement of this Act, and shall thereafter be liable only to the payments prescribed in the schedules appended to this Act, and at the end of the twelfth year may be extended to twenty-one years, subject to payment of the sums prescribed in said schedules.

7. After a patent shall have been sealed, the failure to pay the stipulated duty at any of the subsequent terms when due shall not invalidate the patent, provided at some period before the expiry of twelve calendar months after such due date the duty shall have been paid, together with such amount of fine as is specified in the appended schedule of fines for postponed payments, but failing that the patent becomes void.

8. There shall be paid to and for the use of the Crown on the several instruments described in the appended schedules the duties and fines mentioned in those schedules, and no others.

9. The term for provisional protection shall henceforth be extended to twelve months, and the patent, when sealed, shall date as of the day on which the petition for letters patent was left at the office of patents for inventions by the applicant.

10. At any time subsequent to the sealing of a patent it shall be in the power of its owner to add to it such improvements as he may desire, unless the Chief Commissioner shall decide that the improvement proposed is not a legitimate addition to the patent, but is more properly the subject for a new patent. For every such addition to a patent, or procedure connected with such addition, there shall be paid one-half of the initial stamp duties, and subsequently one-half of each stamp duty still remaining to be paid, as these may fall due on the original patent, or with proportionate fines for postponed payment. Any such addition to a patent shall expire along with the original patent.

11. A patent shall have to all intents the like effect as against Her Majesty the Queen, her heirs and successors, as it has as against a subject, but the Secretary of State of any Department may, with consent of the Treasury, use for the public service any patented article, or any patented manufacturing process, on such terms as may be agreed on with the owner of the patent, or failing such agreement, the Treasury and the owner shall each appoint an arbitrator, and the arbitrators shall appoint an umpire in event of disagreement, and the terms so arrived at shall be binding on both parties.

12. Employment in the public service shall not preclude any person from taking out or owning a patent or from any participation in the privileges of a patentee, but this provision shall not apply to any person employed in the Office of Patents for Inventions.

SCHEDULE OF STAMP DUTIES.—On petition for grant of Letters Patent, 10s. Notice to proceed, 10s. Warrant, £1. Sealing of Letters Patent, £1. Specification, £1. At the end of seven years, £20. At the end of twelve years, £40. At the end of seventeen years, £40. Notice of objections, £1. On certificate of every search and inspection, 1s. On certificate of entry of assignment or license, 5s. On certificate of assignment or license, 5s. Application for disclaimer, £1. Caveat against disclaimer, £1. On every addition to a patent one-half of the above stamp duties.

SCHEDULE OF FINES FOR POSTPONED PAYMENTS.—If paid within three months after due date, 25 per cent. on the duty then due. If paid within second three months' 50 per cent. If paid within third three months' 75 per cent. If paid within fourth three months' 100 per cent. On every addition to a Patent, one-half of the above fines.

Proceedings of Societies.

ROYAL SOCIETY.

APRIL 29.—The Treasurer in the chair.—The following papers were read, "Note on the Spectrum of Carbon," by Mr. N. J. Lockyer; on "The Diurnal Variation in the Amount of Carbon-Dioxide in the Air," by Prof. G. F. Armstrong; "Measurement of the Actinism of the Sun's Rays and of Daylight," Preliminary Notice, by Dr. A. Smith; on "Some Elementary Principles in Animal Mechanics, No. X. (concluding the Series), further illustrations of the 'Law of Fatigue,'" by Rev. Professor Haughton; and on "The Absence of Potassium in Protagon prepared by Dr. Gamgee," by Prof. Roscoe.

BRITISH ARCHÆOLOGICAL ASSOCIATION.

APRIL 7.—Mr. H. S. Cuming in the chair—Mr. Irvine reported the discovery of a large number of fourteenth century tiles during the restorations now in progress at Bangor Cathedral Many of these are of great beauty.—Mrs. M. Hyde exhibited a large number of early newspapers, showing in a remarkable manner the rapid progress of journalism.—The discovery of a Roman villa near Brading, Isle of Wight, was announced by Mr. J. Henry. The site is on Morton's Farm, and already a tesselated pavement and several continuous walls have been excavated.—Mr. R Blair described a small Roman altar which has been found at the Lawes, South Shields, the site of the recently discovered Roman station.—Mr. L. Brock exhibited a large number of fragments of Roman fictile vessels found in London, and remarkable for their indicating various classes of pottery made by that people. One of these had a potter's mark in cursive characters, which were at first taken for Hebrew.—Mr. C. Warne exhibited some Etruscan objects of great interest, one being the attenuated figure of a warrior, and intended to represent his departed state.—Various other objects were exhibited by the members, and among these were two pewter measures by the Rev. S. M. Mayhew, one being inscribed, "Timothy Buck at ye Fountain in Portugall Street against ye Playhouse," and the other with the name of "R. Yeo at ye Blew Lattice in Ship Yard within Temple Bar." Many interesting records of the old playhouse were noted, and Mr. Lambert called attention to the marks on early pewter work —The first paper was by the chairman, who traced the history of ladies' work-bags, and indicated the amount of interest and information that might be obtained from these articles, which were now in less use than formerly.—The lecturer illustrated his remarks by the exhibition of several examples of English and foreign work; one, of seventeenth century date, was elaborately worked in crewels.—The second paper was by the Rev. Prebendary Scarth, on a series of sepulchral inscriptions brought from Italy, and now at Rookwood House, near Llandaff. The importance of making collections of inscriptions in private possession was dwelt upon.—In conclusion, Mr. Lambert referred to the impending removal of the old buildings opposite Lambeth Church.

ZOOLOGICAL SOCIETY.

APRIL 6.—Prof. W. H Flower, President, in the chair.—The Secretary read extracts from letters which he had received from Mr. W. A. Conklin, of New York, relating to the birth of an elephant which had lately taken place in a travelling menagerie at Philadelphia.—Papers and communications were read, by Prof T. H. Huxley, on "The Distinctive Characters of the Species of the Genus Canis, as shown in certain points of the structure of their skulls and in the proportions of their teeth;" by Dr. F. Day, on "The Fishes of Afghanistan," based principally upon a collection which had been made for him in the highlands of Kelat and Quettah by Dr. Duke; and from Prof J. von Haast, on a specimen of a rare Ziphioid whale (*Epiodon Novæ-Zealandiæ*), which had been cast ashore at New Brighton, New Zealand, in July, 1878

MAY 4.—Prof. W. H. Flower, President, in the chair.—The Secretary read a report on the additions made to the Society's Menagerie during April, and called special attention to an example of the short-nosed Perameles (*Perameles obesula*), purchased April 15th, being the first example of this marsupial which had been received: to a young male Cape hunting dog (*Lycaon pictus*); and to a Koala, or native bear of Australia (*Phascolarctus cinereus*), purchased April 28th, the first example of this marsupial that had been brought alive to Europe.—Mr. Sclater exhibited a specimen of the ibis (*Geronticus comatus*) late obtained at Biledjik, on the Euphrates, by Mr. Danford, and made some remarks on its previously known distribution —Letters and communications were read by Dr. A. Gunther, on the statement made by him, at the meeting on 20th of January last, respecting the occurrence of *Holocanthus tricolor* on the British coast: further particulars received led him to decide that this fish could not be considered as having been caught on the British coast; by Mr. W. A. Forbes, on the cause of death of a leopard in the Society's Menagerie, by Mr. Dobson, on some bones of the dodo, transmitted from Mauritius in 1847-50; by Prof. Flower, on the fact that a young specimen of the lesser fin whale (*Balænoptera rostrata*), fifteen feet long, which had been taken off the coast of Cornwall, was now being exhibited in London; from Prof. J O. Westwood, an account of the species of saw-flies comprising the Australian genus Perga of Leach; from Dr. W. J. Hoffman, on a supposed instance of hybridisation between a cat and a lynx; by Mr. W. A Forbes, the second and third parts of his series of papers on the anatomy of Passerine birds; from Mr F. Day, on a new Entomostracon from Afghanistan; by Mr. O Thomas, on a collection of mammals brought from Ecuador by Mr. Clarence Buckley · among these was a new species of Bassaricyon, proposed to be called *B. Alleni*; by Mr. A. G. Butler, on a collection of Lepidoptera made by Major H. Roberts at Rokeran, near Kandahar, on the river Urgundab; by Mr. G F. Angas, on the marine molluscan Fauna of South Australia, with descriptions of six new species, and on three species of marine shells from Port Darwin, Torres Straits, discovered by Mr. W. J. Bednall, and on a new Helix from Kangaroo Island, South Australia; and Mr. F. J. Bell exhibited the immature specimen of Echinolampas referred to by him in his communication on Palæolampas, pointing out its more differentiated characters, and suggesting the possibility of its being an example of *E. Oviformis*.

INSTITUTION OF CIVIL ENGINEERS.

APRIL 13 —Mr. W. H. Barlow, President, in the chair.—The following papers were read, on "The Abingdon Sewerage," by Mr. C. F. Gower; and on "The Main Drainage of Torquay," by Mr. G Chatterton.—M. de Lesseps was proposed by the Council for election as an Honorary Member.

MAY 4 —Mr. W. H. Barlow, President, in the chair —At the monthly ballot Count F. de Lesseps was elected an Honorary Member; Messrs. H. J. Pauling, C. Pihl, and G [illegible]aton were elected Members, and Messrs. J. R. Abbey, E. S. Barlow, J. G. H. Clow, W. P. Costobadie, J. Craig, J G. Griffin, M. W. Hervey, E. Hesketh, P. H. Holmes F. Hudson, H. D. Johnston, J. Lyons, J. C. Mackay, T. Michell, M. J. Monckton, R. O. Paterson, J. C. Peache, G. Purcell, F. Sharp, J. D. Thomas, L. G. Tyrrell, E. F. Welch, and R. S. Wyld, jun., Associate Members.

MAY 11.—Mr. W. H. Barlow, President, in the chair.—The following papers were read on "The Manufacture and Testing of Portland Cement," by Major-General H. Y. D. Scott and Mr. G. R. Redgrave; on "Portland Cement Concrete and some of its Applications," by Mr. E. A. Bernays; and on "Portland Cement: its Nature, Tests, and Uses," by Mr. J. Grant.

SOCIETY OF ARTS.

APRIL 8.—A paper on "Recent Improvements in Benzine Colours" was read before the Applied Chemistry and Physics Section by Mr. F. J. Friswell.

APRIL 12.—Mr. R. W. Edis delivered the second lecture of his course on "The Decoration and Furniture of Town Houses."

APRIL 14.—G. Bullen, Esq., in the chair. —Three candidates were proposed for election.—A paper on "The History and Art of Bookbinding" was read by Mr. H. B. Wheatley.

APRIL 16.—Sir T. Douglas Forsyth in the chair.—Prof. A. Vambéry, who had come over to this country at the invitation of the Council, read a paper on "Russia's Influence over the Inhabitants of Central Asia during the last Ten Years" before a meeting of the Indian Section of the Society.—A discussion followed, in which Sir E. Perry, Sir R. Alcock; and others took part.

APRIL 19.—R. B. Carter, Esq., in the chair.—The third lecture of his course on "The Decoration and Furniture of Town Houses" was delivered by Mr. R. W. Edis. The lecture was directed to a comparison of ancient and modern furniture, and to the methods adopted in the construction of furniture generally

APRIL 21.—Sir Coutts Lindsay in the chair.—Fourteen candidates were proposed for election as Members —A paper on "The Present System of obtaining Materials in use by Artist Painters as compared with that of the Old Masters" was read by Mr W. Holman Hunt.

MAY 3 —Mr. R. W. Edis gave the fifth lecture of his course of Cantor Lectures on "The Decoration and Furnishing of Town Houses" The colouring, decoration, and general treatment of the drawing-room, boudoir, bed-room, and offices formed the principal subject of this lecture.

MAY 5.—J. Caird, Esq., in the chair.—Thirteen candidates were proposed for election as Members.—A paper, entitled "Agricultural Experience: the Lesson of Forty Years,' was read by Mr. J. C Morton.

MAY 6.—Lord A. S. Churchill in the chair.—A lecture on "Fleuss's Diving Apparatus" was delivered by Dr. B. W. Richardson. The various parts of the apparatus were exhibited, and demonstrations of its use given by Mr. Fleuss.

MAY 7.—Sir W. R. Robinson in the chair. —A paper on "The Present Condition and Prospects of Agriculture in Southern India" was read before the Indian Section of the Society by Mr. W. Robertson.

MAY 10.—R. B. Carter, Esq., in the chair.—Mr. R. W. Edis delivered the concluding lecture of his course of Cantor Lectures on "The Decoration and Furnishing of Town Houses," dealing principally with the various fittings and articles of domestic use, and the means by which they may be applied to the general scheme of decoration.

MAY 12.—Five candidates were proposed for election as members.—A paper on "The Utilization of Blast Furnace Slag for Building and other Purposes" was read by Mr. C. Wood.

MATHEMATICAL SOCIETY.

April 8.—C. W. Merrifield, Esq., President, in the chair.—Mr. J. Barnard was elected a member, and Mr. T. O. Harding admitted into the Society.—The following communications were made, "A (presumed) New Form of the Equations determining the Foci and Directrices of a Conic whose Equation in Cartesian Co-ordinates is given," by Prof. Wolstenholme; "The Application of Elliptic Co-ordinates and Lagrange's Equations of Motion to Euler's Problem of Two Centres of Force," by Prof. Greenhill; "Theorems in the Calculus of Operations," by Mr. J. J. Walker; on "The Equilibrium of Cords and Beams in Certain Cases," by Mr. W. J. C. Sharp; on "Steady Motion and Vortex Motion in an Incompressible Viscous Fluid," by Mr. T. Craig; and on "Functions analogous to Laplace's Functions," by Mr. E. J. Routh.

PHYSICAL SOCIETY.

April 10.—Prof. Fuller in the chair.—Mr W. O. Smith and Prof. Judd were elected members.—A paper by Mr. W. Ackroyd, on "The Human Eye as an Automatic Photometer," was read.—Prof. Ayrton explained the experimental fact in frictional electricity exhibited at the last meeting on the ground that one of the substances, glass, was an electrolyte.—Dr. Stone described a new tonometer, devised by Prof. R. König, on the combined principle of a clock regulated by a tuning fork and Helmholtz's vibration microscope.—Dr. Guthrie exhibited a collodion and cats' fur electric machine giving negative sparks. He also showed that an iron cylinder revolving round its longer axis, with a current of electricity flowing in a wire parallel to the axis, had power to deflect a magnetic needle; and Prof. Ayrton stated that by experiments of his and Prof. Perry's he found that the cylinder alone possesses this power, and therefore thought the current was perhaps unnecessary to produce the effect exhibited by Prof. Guthrie.

May 8.—Prof. Sir W Thomson in the chair.—Dr. E. Obach, Messrs. E. F. Bamber, R. D. Turner, E Woods, H. E. Roscoe, and H Watts were elected members.—Prof. Minchin continued the account of his researches given at the last meeting, and showed that the fall of light on fluorescent bodies gave rise to electricity.—Dr. O. J. Lodge described improvements made in his new electrometer key for delicate researches, increasing its efficiency and convenience. He also described an inductometer, or modification of Prof. Hughes's induction balance, enabling electric resistances and capacities to be measured.—Prof. Adams then took the chair, and Sir W. Thomson described his new water steam pressure thermometers for the accurate measurement of low temperatures and ordinary temperatures, based on the relations of the temperature and pressure of water steam. Sulphurous acid vapour and mercury vapour are also to be employed by him in thermometers.

GEOLOGICAL SOCIETY.

April 14.—R. Etheridge, Esq., President, in the chair.—Messrs. C. Brown, J. N. Dufty, and G. B. Nichols were elected Fellows.—The following communications were read, on "A new Theriodont Reptile (*Cliorhizodon Orenburgensis*, Twelvetr.) from the Upper Permian Sandstone of Kargalinsk, near Orenburg, in South-Eastern Russia," by Mr. W. H. Twelvetrees; and on "The Classification of the Tertiary Period by means of the Mammalia," by Prof. W. B. Dawkins.

April 28.—R. Etheridge, Esq., President, in the chair.—Rev. J. O. Bevan, Messrs. A. Hague, A. C. Maybury, H. P. Meaden, W. P. Propert, and F. Randell were elected Fellows.—The following communications were read, "Description of Parts of the Skeleton of an Anomodont Reptile (*Platypodosaurus robustus*, Ow.), from the Trias of Graaff Rainet, South Africa," by Prof. Owen; "Note on the Occurrence of a new Species of Iguanodon in the Kimmeride Clay at Cumnor Hurst, Three Miles west of Oxford," by Prof. J. Prestwich; and on "*Iguanodon Prestwichii*, a new Species from the Kimmeridge Clay," by Mr. J. W. Hulke.

ASIATIC SOCIETY.

April 19.—Sir H C. Rawlinson, K.C.B., President, in the chair.—La Comtesse de Noailles, Col. Keatinge, Mr. G. H. M. Ricketts, and Mr. J. P. Harrison were elected Resident Members.—Prof. Vámbéry read a paper on "The 'Uzbeg Epos,'" a work comprehending many points of interest, historical, geographical, and ethnological, in which he pointed out that the manuscript containing these poems was wholly different from the small treatise edited some years since by M. Berezin, in that it contains seventy-nine cantos and eight thousand lines. The subject of it is the wars of Sheibani Khan, the famous conqueror of Central Asia and rival of Báber, which are reported in a most full—indeed, often tedious—prolixity. Considered as a poem, it is inferior to some other similar Oriental compositions, but it gives a most valuable account of many events we knew of previously only through the medium of partial Persian writers, or from the memoirs of Báber. It gives at the same time many and various interesting details of the ethnology and ethnography of Central Asia, so that we thus gain a clear insight into the ethnical and social life of that portion of the globe at the beginning of the sixteenth century. The author of the epic was Muhammad Khan, a prince of Khiva, Court poet to, and one of the generals of, Sheibani. He is believed to have met a premature death on the battle-field.—After the paper had been read there was a discussion, in which the President, Col. Yule, Mr. Redhouse, and Mr. H H. Howorth took part.

May 10.—Sir T. E. Colebrook, Bart., M P, in the chair.—His Excellency the Chinese Ambassador was elected an Honorary Foreign Member.—Mr H. B. Low was elected a Resident, and Messrs. J. S. Bond, W. F. Hooper, C. E Pitman, and Mahendra Lal Sircar, Non-Resident Members.—M. Terrien de la Couperie read a paper "Sur l'Histoire de la Langue Chinoise et de quelques Noms Geographiques de l'Empire du Milieu," in which he pointed out the great value for the history of a large portion of the world of a Chinese work called the "Yh Sing," which had hitherto been altogether misunderstood. A great part—more than half—of this work consists of lists resembling the syllabaries which have been recently made known to us from the cuneiform inscriptions. To show this the writer gave a complete translation of one chapter, and showed the identity of the lists in it with the cuneiform syllabaries, his conclusion being that the most ancient Chinese was a member of the Amardian branch of the Uralo-Altaic agglutinative languages, thus forming a connection between the dialects of Susiana and the Ugro Finnish. He then gave a history of the writing itself and of the hieroglyphic revival of the ninth century B.C, which followed a form exhibiting the characteristics of cuneiform writing. His general conclusion was that about twenty-five centuries B.C. certain families or tribes left northern Susiana and entered China, after an element of feudal agglomeration had commenced in the kingdom of Susa, and thus carried with them the rudiments of Akkado-Chaldæan culture.

NUMISMATIC SOCIETY.

April 15.—J. Evans, Esq., D.C.L., President, in the chair.—Mr. R. Watts was elected a Member.—Mr. Sheriff Mackenzie exhibited two Durham pennies of Edward II., having the limbs of the cross on the reverse formed of two croziers instead of one, as on Bishop Kellow's coins.—Mr. A. E. Copp exhibited two proofs in silver and one in copper (gilt) of the Paris Mining Company's Anglesea tokens, two varieties, 1787 and 1788.—Mr. Hoblyn brought for exhibition twenty varieties of the shilling of Charles II., many of them of great beauty, and some extremely rare.—Mr. A. Durlacher exhibited a fine specimen of the 1666 crown of Charles II., with the elephant under the bust; a sixpence of William III., 1700, with a minute plume under the bust; a very fine shilling of James II., 1685, and a sixpence of 1686; also, a milled shilling of Elizabeth, with the star mint mark —Dr. A. Colson communicated a paper on the meaning of a well-known reverse type of a coin of Tarentum of the fourth century B.C, on which a youth is represented kneeling beneath a horse and examining his hoof. Dr. Colson pointed out that he could not be shoeing the horse, as some have supposed, as the Greeks never shod their horses, but hardened their hoofs by causing them constantly to stand and exercise upon hard stones.—Mr S. Sharp sent a paper on some new coins of the Stamford mint; and Mr. B. V. Head read the second portion of his paper on "The Chronological Sequence of the Coins of Ephesus."

SOCIETY OF ANTIQUARIES.

April 15.—H. Reeve, Esq., V.P., in the chair.—Notice was again given of the anniversary meeting for the election of Council, President, Treasurer, and Director, and a list of the names of those proposed to fill those offices was read.—The Rev. I. G. Lloyd exhibited a wooden carving of the entombment of our Lord from a church in Havre, and two Russian polyptychs or hagioptychs, one in metal, with four leaves enamelled, and the other painted on fifteen leaves of wood.—Mr. A. W. Franks exhibited, by permission of Mr. T. M. Dodington, a beautiful gold ring of the fourteenth century, with the words "Iaspar, Melchior, Baltasar," inscribed on it. Mr. Franks also gave an account of the Greenwell collection, presented to the British Museum by the Rev. W. Greenwell, and comprising the results of twenty years' excavations in the barrows, chiefly of the north of England.—Mr. E. Freshfield, V.P., laid before the meeting an account of a Greek Creed, which occurs, transliterated, in a manuscript in the British Museum, known by the name of the Psalter of King Athelstan In form it resembled the Apostles' Creed (so-called), but not without considerable variations, which Mr Freshfield proceeded to point out, comparing it with other versions of that Creed, and especially with a Latin version in a Bodleian manuscript known as the Codex Laudianus

April 29—A W. Franks, Esq., V.P., in the chair.—Mr. Franks's appointment as Vice-President was read.—Mr. R. Brown, jun., exhibited and presented a portrait of the poet James Montgomery, engraved from a drawing by Mr. Westeley.—Mr. E. Peacock exhibited a square tablet or amulet of lead with magical symbols, found when digging in or near the disused burial-ground of Kettleby, near Brigg.—Mr. Franks exhibited a rubbing of a similar tablet now in the British Museum.—Mr. E Seebohm communicated a paper on "Serfdom in its Connection with the Open-Field System" The object of the paper was to examine the question whether the English open field system in early Saxon times was the shell of a free village community or of a community in serfdom. It commenced with a brief recapitulation of the results of a paper read last year, in which the various features of the English open-field system—the little strips and balks and furlongs and linches by which it was marked—were traced back behind the Domesday survey and the Saxon charters and laws, and found to be existing also in Wales, and connected with a system of common ploughing with a team of eight oxen. It was shown that the yardland, the holding of the villanus of the survey, of the Saxon *gebur*, contributed two oxen to the common plough team, and consisted of about thirty acre or sixty and a half acre strips, scattered all over the open fields of the village, and that about three-fifths of the arable land of England was held in yardlands at the time of the survey. The inquiry was then entered upon whether in early Saxon as in Norman times these yardlands were held in serfdom, or whether they were the "alods" of freemen. Three Saxon documents, all of them well-known to former writers, and describing the services of the holders of yardlands, were examined under the fresh light given by the knowledge of what the yardland was, and of its importance as the normal holding of the villanus, or *gebur*. The first of them was the "Rectitudines Singularum Personarum;" the second, a charter of the manor of Tidenham, at the mouth of the Wye; the third, a charter relating to a royal manor of King Alfred. All three documents conclusively showed that the services of the yardland in the ninth and tenth centuries were as distinctly serfdom as anything after the Norman conquest, whilst the identity of phraseology between them and the laws of Ine throws the evidence back very much earlier into the Saxon times. The fact that serfdom was a Saxon imposition on the top of the open-field system which already existed in Britain was then further confirmed, first, by the identity of English serfdom with early Teutonic serfdom on the Continent, and, secondly, by the absence of anything similar to it in the Welsh system as disclosed in the Welsh laws. Further, from the Welsh system was drawn the inference that the two points—equality and community—which at first sight point to a free village community, may be really the notes of serfdom. It was shown that there could be no permanent equality of holdings with allodial ownership, the allodial law of equal division between heirs always necessarily producing inequality. Finally, serfdom was shown to arise naturally from conquest, and the prevalent rule of ancient races illustrated by the Welsh laws, which limited allodial freedom to freemen of their own race, acknowledging no rights of inheritance in strangers and conquered peoples In conclusion, it was pointed out that all the lines of evidence conspire to show that serfdom was imposed upon the open-field system in Britain at the Saxon conquest, and that under Saxon rule in England the open-field system was from the first not the shell of a free village community, but the shell of a community of serfdom.—At the close of this paper a discussion ensued, in which Mr. Justice Fry, Messrs. S. Moore, L. Gomme, and H. S. Milman took part. The general purport of the criticisms offered was to show that Mr. Seebohm appeared to have not taken account of those evidences of freedom in Saxon times which were embodied in the existence of the manorial courts, such as the Court Baron, the Court of the Free Peers. "Whence, if not from the Saxons," said Mr. Justice Fry, "did this court come? On Mr. Seebohm's theory the Court Baron was a residual phenomenon."—Mr. S. Moore observed that Mr. Seebohm took too severe a view of the so-called serfdom of the ancient tenant. The services which he is described to have rendered were rather in the nature of rent; at a time when currency was relatively scarce labour became its equivalent. He thought it would be found that the decrease of the prædial services was concurrent with the increase of currency. It was then no longer necessary to pay rent in the shape of labour.

ROYAL INSTITUTION

MAY 1.—Annual meeting.—G. Busk, Esq., Treas and V P., in the chair.—The Annual Report of the Committee of Visitors for the year 1879, testifying to the continued prosperity and efficient management of the Institution, was read and adopted. The real and funded property now amounts to nearly £85,000.—The following gentlemen were elected as officers for the ensuing year: President, the Duke of Northumberland; Treasurer, G. Busk, Esq.; Secretary, Warren De La Rue, Esq.; Managers, Earl Bathurst, G. Berkley, W. Bowman, Dr. T. Boycott, F. J. Bramwell, J. Brown, Earl of Derby, Captain D. Galton, Hon. Sir W. R. Grove, C. H. Hawkins, W. W. Lloyd, H. Pollock, Dr J. Rae, R. P. Roupell, and J. Spedding; Visitors, G. B. Buckton, S. Busk, The Lord S. Cecil, G. H Darwin, W. H Domville, J. N. Douglass, Right Hon. Lord Claud Hamilton, A. G Henriques, Dr. R. Mann, J F. Moulton, W. H Preece, L. M. Rate, J. Romanes, Hon. J G. P. Vereker, and E. Woods.

MAY 3.—G Busk, Esq, Treas. and V.P., in the chair.—Mrs. B. Lees, Col. J M. Innes, Messrs. S. E. Kennedy, E Pollock, and C. Van Raalte were elected Members.

SOCIETY OF ENGINEERS.

MAY 3.—Mr. J. Bernays, President, in the chair —The paper read was by Mr G. Smith, on "The Design and Reconstruction of the Tay Bridge."

STATISTICAL SOCIETY

APRIL 20. –W. Newmarch, Esq., in the chair.—Dr. Mouat, Foreign Secretary and Vice-President, read a paper on "The Education and Training of the Children of the Poor."

LINNEAN SOCIETY.

APRIL 15.—The Rev. G. Henslow in the chair.—Messrs. S. H Wintle and G Bay were elected Fellows.—A paper by the Rev. R Boog Watson, on "The Mollusca of the Challenger Expedition," was read. Some thirty-five species are described, whereof the greater part are new forms, belonging to the families Solenoconchia, Trochida, Rissoellidæ, Littorinidæ, and Cerithiidæ. The author observes that temperature, even more than mere depth, seems an important condition in molluscan life, while both prove barriers to distribution, though great length of time naturally helps escape from these barriers Where barriers of depth and temperature do not check distribution, there is no limit to universality of distribution, and such is the case with certain existing species, still there is no trace of especial lasting and progressive change.—A communication was read by Mr. N. E Brown, on "Some new Aroidea, with Observations on other known Forms." Of the former, the specimens are contained in the Kew Herbarium, and the latter are annotations chiefly supplementary to Prof. Engler's recent monograph on the order. While following Engler the author has given preference to the classification of Schott. Among others several interesting new Bornean forms are described.—Prof. F. J Bell next read a "Note on an Abnormal (quadriradiate) Specimen of *Amblypneustes formosus*," and afterwards Mr. C. Stewart exhibited and made remarks on another but differently abnormal specimen of the same species. Prof Bell, after a full description, observes that, with more or less reason some naturalists have looked on the possession of other than five rays as a character of some specific value among the Asteridæ and Ophiurida, and have considered that, on account of its greater rarity among the latter, it is of greater value as a mark of distinction; but such a view must be taken with considerable limitation. The pentamerous arrangement of parts in the regular Echinoidea is there only disturbed in one example; information and specimens are, however, at hand to show how this may have happened; the rarity of any divergence from this five-part division, in face of the numerous variations which occur in the Echinodermata, will doubtless become more and more important as a factor in determining the genealogical history of the group.—A series of microscopical sections of pearls, exhibiting many irregularities in structural detail, were shown by Dr. J. Murie, and their several pecularities explained.

MAY 6.—H. T. Stainton, Esq., in the chair.—Three foreign members were elected. —Mr. T. Christy read a letter from Mr. Blacklaw, of St. Paulo, Brazil, announcing that his experiments to rear the Liberian coffee plant had all failed, though different seasons, altitudes, and other conditions without and indoors had been tried.—The abstract of a paper by Prof. G. Dickie, "Notes on Algæ from the Amazon," was read by the Secretary. This collection was made by Prof. Traill, and consists of 288 species, whereof 190 are Diatoms, 31 Desmids, and 63 other Algæ, 9 of the last being new forms.—Prof. P. M. Duncan orally communicated the substance of a paper on "An Unusual Form of the Genus Hemipholiss, Agass." This was dredged by Dr. Wallich off the Agulhas Bank, south-west of the Cape of Good Hope. Its zoological position may be doubtful, for the classification of the Ophiuroidea is at present full of anomalies, but the specimen itself nevertheless possesses unusual interest from the nature of the so-called dental or chewing apparatus. These peculiar oral structures and other points were elucidated by the author. —Mr. G. T. Bettany gave some remarks on the vocabulary of botanical terms in use in the description of flowering plants. The author advocated making a distinction between terms used in elementary descriptions in educational works and those used in the terse and complete floras. Under evolution there was much chance of botanical progress if terms were simplified and made such as children could comprehend; but almost every book aiming at comprehensiveness became obscure. Thinking it necessary to give every possible variety of terms, and to add to them, it repelled instead of aiding in the wide diffusion of knowledge. For these and other reasons the author strongly objected to the now too frequent use of tri- and poly- syllabic terms —Prof Ray Lankester read a paper on "The tusks of the Fossil Walrus found in the Red Crag of Suffolk." He withdraws the generic name of Trichecodon, instituted by him in 1865, and refers a series of later discovered large tusks in the Ipswich Museum, as also his formerly described specimens, to the living genus Trichechus, but specifically distinguished in this case as *T. Huxleyi*. He is inclined to think there is insufficient ground for the generic subdivisions Alachtherium and Trichecodon as used by Van Beneden, and, moreover, signifies his opinion that there is yet no good evidence in support of the association of the Suffolk and Antwerp tusks.—A short communication on "An Irregular Species of Amblypneustes," by Mr. C. Stewart, was taken as read.

CHEMICAL SOCIETY.

APRIL 15.—Prof. H. E. Roscoe, President, in the chair.—The following papers were read, on "The Lecture Illustration of Chemical Curves," by Dr. E. J. Mills. The author has contrived an apparatus for exhibiting the variations in the actions of sulphuric acid on zinc and sodic hydrate on aluminium produced by alterations (1) in the strength of the solution, (2) in the time during which the action is allowed to proceed; on "The Analysis of Organic Bodies containing Nitrogen," by Mr. W. H. Perkin; on "The Volatilisation of Solids in Vacuo," by Mr. W. D. Herman; on "The Determination of Nitric Acid as Nitric Oxide by means of its Reaction with Ferrous Chloride," by Mr. Warington. The author describes an apparatus for the above purpose. The air is expelled by carbon dioxide, the nitrate heated by a calcium chloride bath to 105 degrees C., and the nitric oxide measured as gas Organic matter does not affect the results; on "The Six Possible Isomeric Dibromtoluols and other of the Bromo and Bromonitro Derivatives of Toluol related thereto," by Messrs. R. Nevile and A. Winther The authors criticise the results of Wroblevsky, *Jahr.* 1870, 528, and 1871, 450, and establish the conclusion that in such bodies the bromine never occupies a position which is "meta" to the amido group.

May 6—Prof. H. E. Roscoe, President, in the chair.—The following papers were read on "The Action of Sodium on Phenylic Acetate," by Messrs. W H. Perkin, jun, and W. Hodgkinson. Hydrogen, acetic ether, phenol, acetic acid, salicylic acid, a white crystalline substance melting at 48° C, having the composition $C_{15} H_{12} O_3$, and a yellow crystalline substance melting at 138°, having the composition $C_{18} H_{14} O_4$, were obtained; by heating cresylic acetate and sodium, acetic ether and salicylic acid were formed; "Preliminary Notice on the Action of Sodium on some Ethereal Salts of Phenylacetic Acid," by Dr. Hodgkinson; on "The Determination of Nitrogen in Carbon Compounds," by Mr. C. E Groves. The author described and exhibited an improved and simple apparatus for facilitating the collection and measurement of the nitrogen evolved during the combustion of a substance according to Dumas's method; on "Essential Oil of Sage," by Mr. M. M. P. Muir; on "The Presence of Nitrogen in Iron and Steel," by Mr. A. H Allen. By passing steam over iron at a red heat, and also by dissolving iron in hydro-chloric acid, the author has satisfactorily proved that ammonia is formed equal to 0·0041 to 0·0172 parts of nitrogen per hundred parts of iron or steel; on "The mode of application of Pettenkofer's Process for the Determination of Carbonic Acid in Expired Air," by Dr. W. Marcet. The author describes and figures a portable apparatus which he has successfully used in upwards of 350 determinations of carbonic acid, made during some investigations on the effect of altitude on the phenomena of respiration; on "An Improved Form of Oven for heating Sealed Tubes and avoiding Risks of Explosions;" and "Note on a Convenient Form of Lead Bath for Victor Meyer's Apparatus for determining the Vapour Densities of High-Boiling Substances," by Mr. W. Smith.

PHOTOGRAPHIC SOCIETY.

April 6.—J. Glaisher, Esq., President, in the chair.—The following papers were read, on "Principles of Optics involved in Lantern Construction, and on a new Enlarging Lens, especially designed for use with the Magic Lantern," by Mr. J. H. Dallmeyer,—a new condenser and objective lenses were shown and described; on "The Use of Silver Iodide in a Gelatino-bromide Emulsion," by Capt. Abney, where no loss of sensitiveness took place, and yellow light could be used for working in; and on "A Drying Box for Gelatine Plates," by Mr. W. England.

ANTHROPOLOGICAL INSTITUTE.

April 13.—Major-General A. Lane Fox, V.P., in the chair—The Director read a paper on "Fijian Burial Customs," by the Rev. L. Fison. There is no uniformity of custom in Fiji, so that no description of what is done by any one tribe can be taken as applicable to all the others. The strangling of widows, however, that they might be buried with their dead husbands, seems to have been everywhere practised. The widow's brother performs the operation, and is thenceforward treated with marked respect by his brother-in-law's kinsfolk, who present him with a piece of land, over which the strangling cord is hung up. Should he, however, fail to strangle his sister, he is despised. When a woman is about to be strangled she is made to kneel down, and the cord (a strip of native cloth) is put round her neck. She is then told to expel her breath as long as possible, and when she can endure no longer to stretch out her hand as a signal, whereupon the cord is tightened, and soon all is over. It is believed that if this direction be followed insensibility ensues immediately on the tightening of the cord, whereas if inhalation has taken place there is an interval of suffering. According to Fijian belief, at a certain place on the road to Mbulu (Hades) there lies in wait a god called Nangga-nangga, who is utterly implacable towards the ghosts of the unmarried, and he classes as bachelors all male ghosts who come to him unaccompanied by their wives. He lifts them above his head, and breaks them in two by dashing them down on a projecting rock. If the wife die before her husband, the widower cuts off his beard, and puts it under her left armpit. This serves as her certificate of marriage; and, on her producing it to Nangga-nangga, he allows her to pass. On the island of Vanua Levu a noted "brave" is distinguished from the common herd after death by being buried with his right arm projecting above the grave-mound, and passers-by exclaim with admiration as they look upon the fleshless arm, "Oh, the hand that was the slayer of men!" By many tribes the burial-place of their chief is kept a profound secret, lest those whom he injured during his life should revenge themselves by digging up and insulting, or even eating, his body. Cave burial is common, although by no means universal; in some cases artificial caves are made, On the death of the king of the Nakelo tribe three old men come, with fans in their hands, and conduct the spirit to the banks of the river. Here they call upon Themba—the Nakelo Charon—to bring over his canoe, and wait until they see a wave rolling in towards the shore, which they say is caused by the approach of the invisible canoe; they then avert their faces, point their fans suddenly to the river, cry aloud, "Go on board, sir," and forthwith run for their lives, for no eye of living man may look upon the embarkation. The grave is dug about hip deep, the body laid in it, and an old cocoa-nut is broken by a blow with a stone, being so held that the milk runs down upon the head of the corpse. The meat of the nut is then eaten by the three elders, and the grave is filled up.—A paper on "The Polynesian Race," by Mr. C. Staniland Wake, M.A.I, was read. The author proposed to show, first, that the Polynesian islanders must be described as a bearded rather than a non-bearded race, and, secondly, that as a rule, they are well acquainted with the use of the bow and arrow, and quoted the observations of numerous travellers in support of his view.—Major-General A. Lane Fox exhibited some paintings and bead mats, the work of Bushmen.

April 27.—Major-General A. Pitt Rivers, V.P., in the chair.—Mr. E. T. Leith was elected a Member.—A paper entitled "Further Notes on the Romano-British Cemetery at Seaford, Sussex," by Messrs. F. G. H. Price and J. E. Price, was read. It was a continuation of one read before the Institute by the same authors in November, 1876. During the summer of 1879 these gentlemen again visited Seaford, and made further excavations in the Roman Cemetery upon the Downs, in which they discovered several urns, a drinking cup of Durobrivian pottery, Samian pateræ, flint celts of the neolithic type, and many flint flakes. In one particular interment a large urn full of charred human bones was discovered, having a Samian cup in its mouth for the purpose of keeping out the earth; another cup, of elegant form, of Durobrivian ware was found on its left side, and a food vessel and patera of Upchurch pottery on the right side. In close proximity to this interment was a similar one; the urn was much crushed, but beneath a patera of Samian ware a coin of Faustina Junior, the daughter of Antoninus Pius and wife of Marcus Aurelius, was found. This was most important as giving an approximate date to the interments; they could not be earlier than between A.D. 161 and 180. In another part of the Downs, in a place called the Little Burys, black patches were of frequent occurrence in the sand, which were composed of charcoal, fragments of burned bone, a flint flake or two, and frequently iron nails. In one particular spot a batch of over ninety iron studs was found, mixed up with bone ashes and charcoal. The authors considered that the patches of charcoal without an urn indicated pauper burials, or the burials of soldiers, as this place was a military station. The pottery and other relics discovered were exhibited. —General A P. Rivers exhibited a series of plans and relics from Mount Caburn.

ENGLISH SPELLING REFORM ASSOCIATION.

April 20.—A. J. Ellis, Esq., in the chair.—The Rev. W. S. Lach-Szyrma read a paper on "International Spelling Reform." In it he discussed the possibility of framing a system which, beyond English, should include all the important languages of the civilised world—Systems hitherto proposed for that object were too complicated for general use; even that of Lepsius, which the lecturer preferred, erred in the multitude of its diacritics. Practically, the basis for a new system was either the Roman or the Cyrillic alphabet. The latter was based upon a perfectly phonetic theory, and was used by a large portion of mankind; but it seemed very doubtful whether it would ever be accepted by Western Europe. We were, therefore, driven to the Roman alphabet as the only practical base. The lecturer then expounded his own suggested alphabet, in which the vowel signs were used for the short Italian vowels, and the long vowels and various modifications of the consonants were indicated by simple diacritical marks, such as a dot or an accent. Mr. Lach-Szyrma pointed out the great advantages in learning to read one's own and foreign languages, and concluded by suggesting a congress of spelling reformers for the discussion of questions relative to international reform.—In the discussion which followed Messrs. Pfoundes, Ball Pagliardini, Fleay, the Rev. J. Long, and the chairman took part.

EDUCATION SOCIETY.

April 21.—Rev. Canon Daniel in the chair. —Rev. R. H Quick read a paper on "The Educational Principles of the Jesuits." He pointed out that the chief merits of the system were the careful study of individual character, the manner in which emulation and interest were excited, and the continuity of the teaching throughout the school

secured by the constant supervision of the rector, who himself took no class.

FOLK-LORE SOCIETY.

APRIL 13.—E. Solly, Esq., F.R.S., in the chair.—The Rev. J. Long read a paper on the importance of publishing a complete collection of proverbs in English, Welsh, Erse, Gaelic, Cornish, classified according to subjects, with explanatory notes. The question in its various aspects was illustrated by quotations from proverbs European and Asiatic; a reference was also made to the Gipsies, whose line of route along the Danubian valley can be traced by the Slavonic and Greek proverbs they have incorporated into their language. Mr. Long submitted to the meeting proposals for the best mode of collecting and classifying the proverbs of England and their parallels in other lands.—Mr. J. S. Udal read a paper on "Dorsetshire Mummery Plays." After having pointed out the general value of the subject, Mr. Udal proceeded to give an account of a play now acted in Dorsetshire.—Among those who took part in the discussions of the papers were Dr. Hyde Clark, who stated that the Smithsonian Institute was collecting mummery plays; Mr. Coote, who gave some interesting proverbs from Pitrè's great collection; Mr. Nutt, who pointed out some parallels between folk-tales and the mummery plays; Mr. E. Walford, the Rev. W. S. Lach-Szyrma, Mr. Pfoundes, Dr. Cheevers, and Mr. G. L. Gomme.

SOCIETY OF BIBLICAL ARCHÆOLOGY.

MAY 4.—Dr. S. Birch, President, in the chair.—The following communications were read, "Libation Vase of Osor-ur, preserved in the Museum of the Louvre," by M. Paul Pierret; "Monuments of the Reign of Tirhaka," by Dr. S. Birch; "An Examination of the Assyrian Ideograph *Mi*," by Mr. R. Brown, jun.; and on "The Expression in Assyrian of the Soft Sound of the Hebrew *Am*," by Mr. R. Cull.

MUSICAL ASSOCIATION.

MAY 3.—Prof. W. H. Monk in the chair.—A paper was read by Mr. C. K. Salaman, on "Music as a Profession in England." Mr. Salaman surveyed his subject from two points of view—the purely artistic and the purely professional; by the former meaning the practice of music with reference alone to the art, its cultivation and progress, and by the latter the practice of music as a source of income; observing that while giving full consideration to the emoluments of his profession, the true musician will never ignore his obligation to art, but will uphold its dignity, and guard with jealous care its inherent purity from every contaminating influence. The necessary qualifications of the successful musician, whether composer, performer, or teacher, were reviewed by Mr. Salaman, who also illustrated his paper by many anecdotes and reminiscences of his personal experience during the last half century.

Mr. William E. Ferguson, of New York City, has patented an improved device for preventing the shifting of grain cargoes in vessels, and to strengthen the vessel at its weakest point, or at the point exposed to the greatest strain when the vessel is loaded to the dead-weight capacity with a cargo of grain.

A water and wind mill, which the inventor designates a "wing-motor," of especial simplicity of construction, automatic in the adjustment of its sails, and capable of utilizing a large percentage of the power of the wind and current of water, has been patented by Mr. J. L. Nevers, of Pass Christian, Miss.

Messrs. John Henderson, Jeremiah H. Henderson, and Justin Notson, of Leon, Iowa, have patented a churn by means of which large and small quantities of butter can be produced, as may be desired, and which is easily operated, and is simple in its parts. It consists of the arrangement of two dashers, which are operated by means of two discs provided with pins that take in the slotted shafts of the dashers, these discs being fastened to the end of a horizontal shaft, which is rotated by means of a crank and bevel gearing.

Mr. Jacob G. Fletcher, of Washington, D.C., has patented for artists' use an improved canvas stretcher which shall have all the qualities experience has decided to be necessary or most desirable, and it consists in constructing the bars or pieces composing the stretcher proper with plain mitre joints, which are opened by means of wedges, and in providing said bars with holes and grooves for the purpose of receiving the fastening device, which is constructed of metal and approximately U-shaped, and when applied to the stretcher frame is sunk or embedded in the wood flush with the surface thereof.

Messrs. James Skidmore, Joseph M. Laston, and Orestes Skidmore, of Charleston, Ill., have patented an improvement in hame tugs for connecting the hames with the traces in the ordinary form of harness. It consists in the peculiar construction and arrangement of the metal clip or plate in connection with the leather tug.

Mr. James C. Stanley, of New Hartford, Conn., has patented certain improvements in the thread boards and thread guides of spinning and twisting machines, whereby the thread guide can be adjusted so that the threads, when delivered from the rolls, will run through the guide centrally with the spindle tip, and thereby escape the usual stretching and breaking.

An improvement in spring vehicles, patented by Mr. William B. Thomas, of Elmira, N.Y., is designed to keep the back springs of a spring waggon under a slight strain when there is no load in the rear part of the waggon, to prevent the rattling and undue wear of the spring joints, and to cause the waggon to ride easier.

An improved ticket holder has been patented by Mr. Sam [illegible]berg, of Pontiac, Ill. It is designed for holding the tickets on which are marked the sizes and other particulars of goods, such as pantaloons and other clothing.

Mr. Emile F. Espérandieu, of Nashville, Tenn., has invented a velocipede of the tricycle class which is adapted for carrying packages, merchandise, or any articles of light weight, and which may be propelled by working swinging treadles having springs that aid in moving them backward.

Mr. Archibald H. Kerr, of Midway, Texas, has patented a composition for whitewashing houses, walls, fences, outbuildings, &c., designed for great smoothness, brilliancy, and durability; and it consists in a compound of lime, whiting, plaster of Paris, glue, carbonate of soda, biborate of soda or borax, and sulphate of soda, in certain specific proportions.

Messrs. Ebenezer Fisher and John Watson, of Kincardine, Ontario, Canada, have patented an improved die for forging metallic horse collar frames. This die has been developed after a long series of experiments. With it the desired perfection of operation and result may be obtained with certainty and precision, and a collar frame produced having the desired form, proportions, and lines of curvature required for greatest strength and lightness combined.

An improved adjustable seat for mowers, reapers, wheeled horse hay rakes, and various other agricultural machines, for farm waggons and other vehicles, or for use in any other situation in which it may be applicable, has been patented by Messrs. Samuel Hedges, of Wheeling, and Lewis B. Morgan, of West Liberty, West Virginia. It is capable of oscillation or adjustment laterally on a fixed point of support, so that it may be kept in horizontal position despite the lateral inclination of the body of the machine or vehicle while passing along a hill side or other inclined surface.

Mr. John B. Fogt, of Anna, O., has patented an improvement in that class of riding rakes in which the wire teeth are attached to the axle, and the driver's seat attached to the hinged thills or shafts, so that upon releasing a locking lever the rake will be dumped automatically by the weight of the driver.

Mr. Talbot C. Key, of White Sulphur Springs, Ga., has patented a portable hay and cotton press, an improvement in the class of portable presses which are mounted on wheels and thus adapted to be conveniently transported from one locality to another without requiring a separate vehicle therefore. The invention consists in hinging the press box to the beams of the truck, so that it can be laid down on its side, for the purpose of transportation, &c., and in the means for securing the press box in the vertical position when required for work.

Mr. David C. Williams, of Florence, Ala., has invented a fruit picker, which consists in a ring fixed on the end of the staff, and having wire fingers projecting from its top portion for the purpose of detaching fruit; also, a basket or fruit receptacle pivoted to and within said ring, so that when the picker is put in use the inclination of the staff or pole will cause the basket to tilt, and one edge thereof to approach the wire fingers, which are holding and pulling the fruit, and hence when the latter falls it is sure to pass into the basket or receptacle.

Mr. Charles S. Peach, of North Adams, Mass., has patented an improvement in ring spinning frames, the object of the invention being to prevent the threads from throwing out and interfering with each other, and to equalise the tension and draught on the thread, whereby the yarn will be wound on the bobbin equally hard and close at top and bottom.

Mr. Heinrich Sock, of Frankfort-on-the Main, Germany, has patented a preparatory bolting machine so combined with a fine dressing machine that it serves for separating the husks, bran, and coarser particles from the meal, and for sorting the meal itself into different degrees of fineness at one operation.

Mr. Alanson Cary, of New York city, has patented a machine for manufacturing metallic barbed ribbon for the wire used for fences so as to give to such a wire a barbed edge. The invention consists in a machine combining a reciprocating head carrying the cutters, a feed bed, and die plate, feeding rollers, and an intermittent feed motion, whereby the ribbon is fed forward beneath the cutters, and the operation performed rapidly without waste of material.

Messrs. John E. Best and William E. Higgins, of Arlington Heights, Ill., have patented an improved thill coupling jack for compressing the rubber in a thill coupling to allow the thill eye or coupling bolt to be readily inserted.

An improvement in machines for depositing fine and powdered substances in uniform quantities in packages, has been patented by Mr. James McCrodden, of New York city. The machines are so constructed that they may be readily adjusted for forming larger or smaller packages. They are convenient in operation, filling the packages quickly, and allowing them to be readily inserted and removed.

Mr. Winfield S. Reeve, of Riceville, Iowa, has patented an improvement in trimming shears for blacksmiths' use. The invention consists in connecting the cam lever with the movable jaw by a slotted plate, so that the operator may stand behind and over his work, thus being enabled to cut to a line.

Mr. Robert F. Dobson, of Darlington, Wis., has patented improvements in that class of weighing scales in which the weight of the object to be made is made to deflect a lever over a curved scale bar, and throw a weight carried by the lever into a position approaching more nearly the horizontal, in which the leverage of said weight is greater.

Messrs. Charles H. Spray and Edward M. Bush, of Seymour, Ind., have patented an improvement in the class of ovens of cooking stoves and ranges whose doors have a movable shelf so connected therewith that the opening and closing of the doors will slide the shelf along the bottom of the oven. The improvement relates to a shelf or false bottom, which is made the full size of the true bottom of the oven chamber, and is supported in guides and moved out and in, as the door opens and closes, by means of a rack and a segmental toothed lever that is connected with and operated by the door.

An improved axle box, patented by George W. Thomas, of Bear River, Nova Scotia, is applicable to carriage, wagon, car, and to all other shafting The invention consists in the combination with friction rolls of an axle box journaled in rings connected by diamond-shaped bars extending the whole length of box.

A novel and simple apparatus to be used in the process of making ice by the absorption or pumping of ammonia gas, has been patented by Mr. Andrew J. Zilker, of Austin, Texas. The invention consists of two or more sheets of galvanized iron or other metal set in a tank of fresh water, one on either side of the evaporation pipes, and held in a position parallel to each other by anchors or yokes that connect them.

Mr. George E. Bigelow, of Geneva, Neb., has patented an improved water elevator which consists of a conical axle carrying a chain or rope to one end of which a weight is fastened, said axle supporting also a wheel or pulley which carries a chain or rope, one end of which is attached to the wheel and the other end to a bucket.

Mr. William H. Hottel, of Woodstock, Va has patented an improved alarm attachment for grist mills, designed to give a distinct alarm for indicating the irregularity of speed, whether in a mill or other class of machinery, which may be heard at any part of the mill, or which, by the aid of a telephone, may be heard at an office, residence, or other point remote from the machinery.

A stationary steam boiler, composed of hot water, steam, feed water, and air tubes laid horizontally, in coils or sections, one above another, in the order named, in a brick fire chamber, and having all the tube couplings and connections outside of the brick work, so that they may be readily got at for examination or repairs, and having also the steam and mud drums outside of the brick work, has been patented by Mr. Milton W. Hazelton, of Chicago, Ill

An improved rubber bracelet has been patented by Mr. David Stone, of New York city. The object of this invention is to furnish rubber bracelets simple and inexpensive in construction and neat and ornamental in appearance. The invention consists in constructing rubber bracelets with extensions upon the opposite side edges of the band to represent buckles; also, in forming slots in the said extensions, and also in the combination, with the slotted extensions, of the cross bar placed upon the inner side of the band, with its ends projecting through the slots and resting upon the side extensions.

Mr. Abraham Van Winkle, of Newark, N.J., has patented a novel frame for anodes, the object being to prevent the falling apart of the particles or pieces of the anode after it has become disintegrated by the action of the electric current while hanging in the solution without substantially interfering with the exposure of the surfaces of the anode to the solution. The invention consists in combining a frame of wood or other suitable material with the edges of an anode of cast or rolled metal.

Mr. Daniel Dunscomb, of New York city, has patented an improved cover designed especially for dredging boxes, or for boxes intended to hold powders of any kind. It consists in a cover, preferably metallic, having a central aperture, and of a perforated metallic cap having a downward projecting notched elastic rim. This cap is removably fitted into the aperture of the cover.

Mr. Nathaniel Pyles, of 43, Canal-street, Chicago, Ill., has patented an improved carpet and floor dust receiver. The object of this invention is to provide a dust-pan or receiver that may be pushed along in front of the person sweeping by the broom as the carpet is being swept in the usual way, to receive all of the dust and dirt raised or swept up by the broom and carry it along until the entire floor has been swept.

An improved plough has been patented by Messrs Peter S. Swartz and Alexander Arnot, of Lexington, Mich. The object of this invention is to provide a double ended plough so arranged that its movement can be easily reversed at the end of the furrow. The invention consists of a double-ended plough having the beam head, to which the beam and the handles are attached, pivoted to a plate on the upper end of the land side in such a manner that the motion of the plough can be reversed by simply turning the handle and beam around the pivot, the body of the plough not being changed in its position.

Mr. Francis Law, Sr., of East Orange (Bloomfield P.O), N.J., has patented an improved hat-flanging machine, so constructed that the sand-weights can be conveniently raised and lowered upon the flanges to press the brims of hats. The invention consists in constructing a hat-flanging machine of a frame having table and bench, a suspended sand-weight, a carriage and track for carrying the sand-weight, uprights, and a treadle for raising and lowering the sand-weight.

An improved breech-loading firearm has been patented by Mr. George H. Fay, of Morrison, Ill. This invention relates to improvements in firearms composed of a number of fixed barrels, and to the mode of firing the arm; and the object of the invention is to give a wider range in the arm, and thus increase its effectiveness; also to arrange the firing devices so that all the barrels may be fired simultaneously or singly.

Mr. James O. Hands, of Louisville, Ky., has patented a novel device for automatically delivering coins for the purpose of facilitating the ready making of change The invention consists of a box or case containing a number of receptacles for holding coins of different sizes, of automatic devices for delivering the coins and sounding an alarm as each coin is delivered, or as the drawer is opened, and of novel devices for locking the drawer and the delivery slides

Mr. Peter W. Nelson, of Moline, Ill., has patented a device of especial convenience to shopkeepers, whereby barrels of groceries or other articles may be supported and readily swung in and out under the shop counter. The invention consists of a vertical bar having at each end a laterally extending hook or clasp, the upper hook or clasp being vertically adjustable, said bar being pivoted above in the under side of the counter, near its edges and below in the floor, so that it can be turned outward to receive a barrel between its hooks or clasps and be swung around to carry the barrel under the counter.

Mr John H. Gable, of Shamokin, Pa., has patented an improved pipe cleaner for cleaning deposits of sediment from the inner surfaces of the column or pump pipes of mine shafts and slopes and for cleaning out other pipes. The invention consists of a pipe cleaner formed of a cylinder or frame provided with cutters to loosen the sediment, wheels to crush and pulverize the sediment, and a brush to sweep the inner surface of the pipe.

A Railway with some novel features has been recently opened between the station of Ribeauvillé (on the Strassburg Basle line) and the town of that name, about 4 kilom. distant. The line is on the road (with which the rails are level), and has a narrow gauge of one metre. There are inclines of forty mm., and curves of fifty metres radius. The train requires only one engineer and one guard. The locomotives weigh nine tons, and among the rolling stock are ten platform waggons, which are arranged for conveying waggons from the main line, without the goods being transferred. These platforms carry two rails, corresponding to the normal larger gauge, and they rest on two bogie trucks, having four wheels each. Thus the larger waggons can be conveyed over the sharpest curves of the narrow line These platform waggons weigh three tons, and the large waggons, with full charge, weigh fifteen tons, giving a total weight of eighteen tons, which, divided among the four axles, gives a maximum load of only four tons fifty per axle. Passengers, as well as goods, are conveyed on the line. The total cost of the line has not exceeded 250,000 francs.

A Royal Masonic Pupils' Assistance Fund having recently been established, a bazaar and fancy fair was recently held—both inclusive—at Freemasons' Tavern, Great Queen-street, W.C. The fund is under the patronage of the Prince of Wales, Grand Master of England, the Duke of Connaught, Prince Leopold, the Duke of Abercorn, Grand Master of Ireland, Sir R. M. Shaw-Stewart, Bart, Grand Master of Scotland, the Earls of Carnarvon, Lathom, Ferrers, Percy, M.P, the Marquis of Hartington, M P., and many other distinguished Freemasons. Among the Lady Patronesses of the bazaar and fair were the Duchess of Athole, the Countesses of Lathom and Rosslyn, Ladies Henniker, Londesborough, &c. We trust this movement will lead to great advantage to the fund.

The Vesuvius Railway.—Tourists are now able to visit the crater of Vesuvius without the labour of climbing, the railway being complete. The depot is situated at a height of 810 metres, or 210 metres above the Observatory A restaurant and café capable of accommodating 100 people is attached to the depot. The angle of inclination of this railroad attains at various points 40°, 50°, and 63°. There are two passenger cars, the Vesuvius and Etna, accommodating 12 persons each. The system adopted in the construction of the railway is of American invention, and is known as "the prismatic system."

If an invention is worthless and it fails of public support, no one suffers but the inventor. If it is good and succeeds, the whole world reaps the benefit. The public, which pays nothing in the one instance and gains enormously in the other, is thus vitally interested in the encouragement of inventions and the upholding of our patent system.

The Conversazione of the Institute of Civil Engineers took place at South Kensington Museum on the 23rd ult. The company, which this year included ladies, were received by the President, W. H. Barlow, Esq., whose invitations were accepted by a numerous and brilliant assemblage.

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Brushes, Brooms, Mops.—G. H. Ellis, R. Auerbach.

Buckles, Clasps, &c.—A. M. Clark (com.).

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Candles, &c.—H. G. Grant (com.).

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Carburetting.—E. Edmonds (com.), S. Trotman.

Carpets, Hearthrugs, and Druggets.—W. Mitchell and M. C. Cuttle, W. J. Aldred, G. H. Ellis.

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Cartridges, &c.—R. Morris, M. Bauer (com.), W. Hope and R. S. Ripley.

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Combs.—F. H. F. Engel (com.), H. Bawcombe.

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Confectionery, &c.—L. Collier.

Cooking, &c.—B. J. B. Mills (com.).

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Cylinders and Rollers, Covering Rollers.—F. C. Glaser, J. Mortimer, M. Kennedy, J. Eastwood.

Disinfecting, &c.—J. Scharr, R. Neale, J. Walworth.

Distilling, Bituminous Distillation, &c.—A. Dudgeon, W. R. Lake (com.), G. W. Davey, L. A. Groth (com.), J. H. Johnson (com.), W. Brierley (com.), J. Imray (com.).

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Engraving.—W. R. Lake (com.).

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Ether.—F. A. Zimmermann.

Explosive Compounds, &c.—A. Hellhoff, E. Edmonds (com.).

Extracts and Infusions (Obtaining).—R. U. Etjensbergen, W. J Clapp.

Eyelets.—B. J. B. Mills (com.), W. Bodill, W. R. Harris and J. G. Croper.

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Filters; Filtering, Purifying, and Clarifying Liquids, Distilling Water, Softening Water.—C. G. Pfander, G. W. von Nawrocki (com.). B. H. Remmers and J. Williamson, U. Neale, F. R. Mallet, R Norton, W. R. Lake (com.).

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Furnaces and Fire-boxes, Supplying Furnaces with Fuel.—S. Pitt (com.), W. Gorman.

Furniture, Upholstery, Cabinetwork, &c.—J. Wetter, B. J. B. Mills (com.), H. J. Haddan (com.), J. and N. Blezard, J. Friborg, G. D. Peters, W. R. Lake (com.).

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Garden Implements.—W. P. Thompson (com.).

Gas, Gasometers, Holders, and Retorts.—S. Pitt (com.), E. Edmonds (com.), S. Trotman, C. Edwards (com.), J. Imray.

Gas Burners.—A. Clare.

Gauges, Water-level Indicators, Indicating Depth, &c.—D. Ellis, D. Cohen.

Glass and its Applications.—R. E. W. Bowen and J. Lewis, E. Edmonds (com.).

Gloves, Gauntlets, Mittens.—I. F. Wauner.

Goffering, &c.—W. R. Lake (com.).

Governors for Engines and Machinery.—D. Moussard, H. J. Haddan (com.), J. Coutts and H. Adamson, F. W. Durham.

Grain and Seeds (Treating, &c.)—W. R. Lake (com.), L. S. Chichester, T. Perkins and S. Handscombe, H. Holt, W Mooney.

Greenhouses, Hothouses, Conservatories, Forcing Pits, and Frames.—A. Smith.

Grinding and Crushing Corn, Grain and Seeds, and Dressing Flour.—F. C. Glaser, H. Chandler and J. R. Richmond, L. S. Chichester, S. Holt, J. H. Johnson (com.), W. R. Lake (com.), W. Mooney, W. R. Lake (com.).

Harness, Saddles, Curbs, Whips, Releasing from Harness, Grooming Horses, Nosebags.—A. M. Clark (com.).

Hatching, &c.—H. Tomlinson.

Hats, &c.—J. Taylor, F. and F. Cree, W. Hyman.

Hay.—J. Howard and E. T. Bousfield, S. Wilkerson, A. W. Tooley.

Heating, Warming, &c.—S. Pitt (com.), A. Mechesney, J. T. C. Thomas, O. Pieper (com.), M. Bauer (com.).

Hinges, &c.—J. Lones, C. Vernon, E. Holden and R. Bennett.

Hoists, Cranes, Capstans, Windlasses, Raising, Lowering and Moving Heavy Bodies, Raising from Mines.—H. F. Brion, T. Wrightson, H. S. Mackenzie, G. Allix, G. W. von Nawrocki (com.), A. Steenberg (com.).

Hoops, &c.—W. Bodill.

Horse Shoes, Shoeing Horses, Shoes for Animals, &c.—W. Spence, C. Wittenstrom.

Indiarubber, &c.—H. Gerner, G. W. von Nawrocki (com.)

Injectors, Ejectors.—S. Borland.

Inks, Inkstands, &c.—H. J. Haddan (com.).

Insulating, &c.—W. R Lake (com.).

Knitting, Tatting, Crocheting, &c.—S. Low and J. N Lamb, H. A. Martin, W. J. Ford, H. J. Haddan (com).

Knives, Forks, Table Cutlery, Knife Cleaners. —J. Pinchbeck.

Lace.—F. Busche.

Lamps, Lanterns, Chandeliers, Candlesticks, Lamp Furniture, Glasses and Shades, Lighting, Producing Light.—J. C. Cohen, D. Heaton.

Leather, Skins, Hides, Artificial Leather and Parchment, Currying, Tanning, Cutting, and Ornamenting Leather.—A. M. Clark (com.), C. D. Abel (com), S. F. Cox, S. Haley, A. M. Clark com.).

Life-buoys, Life Preservers, Rafts, Life-boats. —J. Wettor (com.), J. F. J Dahse

Lime, &c.—S. Pitt (com.), T. Hicken and J. Hopewell.

Locks, Latches, Bolts, Lock Furniture, Keys.—W. B. Shorland, P. D. Reynolds, H. Brittain.

Looking Glasses, &c.—E Evans and J. N. Lee.

Mangles, &c.—E. Taylor.

Manure, Treating Sewage.—J. Imray (com), J. Duke.

Matches, &c.—C Kesseler (com), M. Wiberg.

Mathematical Instruments.—D. Hammond.

Measuring, &c.—W. R. Lake (com.), J. Fisher, G. Cucco.

Medicines, Drugs, &c.—G. Holland, G. O. Willis, W. Downie.

Metallic Alloys.—J. McL McMurtrie.

Metals (Annealing, &c.)—I Jones.

Metals (Casting, &c)—J. Mortimer, J. Wetter, T. H. Chatton, C. Wittenstrom.

Metals, Cutting, Planing, &c.—H. Smith, S. Buckley, W. R. Lake (com.), C. D. Abel (com.).

Metals (Forging, &c)—H. Smith, G. M. Cruickshank (com.), E. W. Richards and S. Godfrey, W. Brierley (com.), H. J. Haddan (com.), A. Scherb.

Metals (Plating and Coating, &c.).—F. Fenwick.

Metals (Smelting, Extracting and Reducing Metals, Heating Ores, Refining, Tempering, and Annealing Metals, Manufacture of Iron and Steel, Metallic Alloys, &c.)—G. Ellinor, E. A. Cowper and T. Sopwith, F. Wirth (com.), W. Gorman.

Meters, Measuring Liquids and Fluids, &c.—H. S. Stewart, R. Schloesser (com.), F. M. Mackay and A. E. Weston, D. Gallafent.

Mining, Boring and Blasting Rock, Raising from Mines, Getting Coals, Draining, Lighting, and Ventilating Mines.—J. Stoleve and W. Tulip, W. Brown, J. Richardson, J. Daye.

Mixing, Kneading, Mashing, Stirring, Agitating, &c.—E. A. Kirby, W. E. Partridge, S. Lindop, W. J. Clapp.

Motive-power Machines, Obtaining Motive-power.—B. J. B. Mills (com.), J. Graddon, W. Allen, J. Broel, J. Stowe.

Nails, Spikes, Bolts, Rivets, Screws, &c.—G. W. von Nawrocki (com.), C. H. Pugh.

Nuts and Washers.—W. Bodill.

Oiling or Lubricating, &c.—J. Heselwood and H. Webster, H. M. Girdwood.

Oils, Fatty Matters, Grease.—G. W. von Nawrocki (com.). C. G. Pfander, H. Holt, T. H. Gray, Z. A. Zimmermann, B. H. Remmers and J. Williamson.

OPTICAL Instruments, Optical Illusions, &c..—J. P. Michaels.

ORNAMENTING, &c.—W. A. Barlow (com.), J. Salmon and R. Phillips, R. E. W. Bowen and J. E. Lewis, A. Clare, E. Evans and J. N. Lee.

OVENS and Kilns.—C. Harvey.

PACKING Pistons, &c.—H. Wedekind (com.).

PACKING, Storing, Baling, &c.—F. Hoyer, A. Stewart and A. Hunter, G. C. Wallich, W. Norton and J. H. Helliwell, J. Nicholls.

PAINTS, &c.—R. Spear (com.), W. J. Clapp.

PANELS.—F. Walton.

PAPER, Pasteboard, Papier Mache: Paper Hangings.—J. Richmond and W. Whiting, J. Salmon and R. Phillips, F. R. Mallet, R. Norton.

PENS, Pencils, &c.—R. Spear, W. R. Lake (com.).

PHOTOGRAPHY and Photographic Apparatus, Pictures Portraits, &c.—R. Knott, W. R. Lake (com.).

PICTURES, Portraits, &c.—J. Wetter (com.), E. Binnechere and H. Cochard, E. Evans and J. N. Lee.

PIPES, Tubes, and Syphons: Joining Pipes.—J. H. Johnson (com.), J. Mortimer, J. D. Pinfold, S. Buckley, A. M. Clark (com.), H. J. Haddan (com.), D. J. Morgan.

PISTONS, &c.—I. Watts.

PRESERVING and Preparing Articles of Food.—F. S. Coles, E. Holland, J. A. Kirby, H. A. Bonneville (com.), J. H. Johnson (com.), W. R. Lake (com.).

PRESSES, Compressing, &c.—J. N. Moore (com.), G. Lowry, A. W. Browtnall, H. A. Bonneville.

PRINTING and Transferring: Type and other Surfaces for Printing, Composing, and Distributing Type.—E. Evans and S. J. Hodson, R. E. W. Bowen and J. E. Lewis, J. Wetter (com.), A. M. Clark (com.), T. and R. Holliday. W. R. Lake (com.), A. M. Clark (com.), J. H. R. Dinsmore and F. Harper, J. J. Sachs.

PROPELLING Machinery, Transmitting Power, and Motion, Converting Movements.—R. Southworth, G. Jones, H. Homan, F. H. Holmes, E. Taylor, J. Turner.

PROPELLING Ships, Propellers, Paddle-wheels and Screws.—H. P. Boyd, T. T. Pearson and W. Hooley, F. H. Holmes.

PULLEYS.—E. and C. Showell and J. Empson, W. R. Lake (com.).

PUMPS, Pumping and Raising Water and other Liquids, Pumps, Pistons, and Packing.—B. J. B. Mills (com.), J. N. Midgley, G. and J. Weir, W. R. Lake (com.), A. B. Brown, A. Anderson, A. M. Clark (com.). U. Bromley, G. Crowe and W. James, P. F. Aerts, W. Anderson and W. Airy, J. Stowe, D. Gallafent, R. Hosking and W. Blackwell, J. B. Duckett.

PUNCHING or Perforating.—H. Smith.

RAILWAY, Permanent Way, Rail Joints, Chairs and Sleepers, Portable Railways, Atmospheric Railways, Switches, Points, Crossings, and Turn-tables.—H. Johnson, W. Brown, J. A. Mays, St. J. V. Day, H. J. Haddan (com.), J. Hough, B. and S. Robinson.

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REAPING, &c.—C. D. Abel (com.), S. Wilkinson, W. R. Lake (com.), A. W. Tooley, W. P. Thompson (com.).

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REFRIGERATING, Cooling Liquids, Making Ices.—F. N. Mackay, W. R. Lake (com.).

REGISTERING, &c.—W. S. and W. O. Smith, J. H. Johnson (com.), J. Donaldson and W. Miller, L. Perrier, J. M. R. Francis, F. W. Durham.

ROADS, Paths, &c.—T. Green and J. Thyne, W. Holloway.

ROPES, &c.—J. H. Johnson (com.), H. E. Newton (com.).

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SHIPS' Logs.—J. R. Neile.

SHIPS (Raising).—H. F. Brion, D. W. Sargeant.

SHIPS' Rigging, &c.—W. Bodill, A. Rickaby.

SHOT, Shell, Bullets, Cartridges, Percussion Caps, &c.—W. Hope and R. Ripley.

SIGNALS, Alarms, Communicating Apparatus, Conveying Sounds.—E. A. Sullivan, H. Johnson, J. Y. Lloyd, G. C. Pulford, J. Wetter (com.), St. J. V. Day (com.), H. J. Haddan (com.), G. W. von Nawrocki (com.), J. Miller and J. Smith, F. W. Gisborne, H. J. Haddan (com.), J. A. Lund.

SYPHONS.—W. E. Hopkins.

SPINNING and Preparing for Spinning.—T. G. S. Garnett, J. R. Day, R. Southworth, J. Law and W. and S. Kitchin, E. Hird, D. H. Brandon (com.), M. Bauer (com.), T. Threlfall, J. T. Taylor and J. Trinker, J. H. Johnson (com.), W. A. Barlow (com.), H. J. Haddan (com.), H. Southwell.

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STAMPS (Revenue), &c.—G. W. von Nawrocki (com.).

STAYS.—W. R. Lake (com.).

STEAM and other Boilers, Cleaning and Preventing Incrustation of Boilers, Water Feeding Apparatus for Boilers.—S. Borland, G. E. Vaughan (com.), G. and J. Weir, J. Nicholson, J. Graddon, S. Fox and D. Grey, G. H. Babcock, S. Wilcox and N. W. Pratt, R. S. Candlish and W. J. Norris, J. D. Churchill, H. J. Harman, H. A. Bonneville (com.), G. W. von Nawrocki (com.), R. Stevenson, C. Pieper (com.), S. Perkins, L. Mills, R. S. Candlish and W. J. Norris, A. C. Henderson (com.), D. J. Morgan.

STEAM Engines (Stationary, Locomotive, and Marine).—B. J. B. Mills (com.), T. Green and J. Thyne, W. S. and W. O. Smith, R. S. Candlish and W. J. Norris, W. R Lake (com.), J. Richardson, E. Edwards (com.), G. Low and E. J. Davies, R. S. Candlish and W. J. Norris.

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TELEGRAPHS; Telegraph Printing Apparatus.—J. H. Johnson (com.), W. R. Lake (com.), C. Kesseler (com.), J. Imray (com.), J. A. Lund.

TESTING Liquids, &c.—L Perrier.

TILLING and Cultivating, &c.—J. Kirkpatrick, T. R. H. Fisken, J. and C. T. Robinson, R. Sellar.

TOBACCO and Snuff, Cigars, Cigar-Holders, Pipe and Cigar-lighters, Smoking Pipes, Tobacco Pouches, &c.—B. J. B. Mills (com.), A. Percy, J. McDonald, J. Thompson.

TRAMWAYS and Tramway Carriages, Tramway, Locomotives.—W. Brown, H. Hughes.

TRAPS for Drains, &c.—J. W. Lamb, C. W. Burge.

TRIMMINGS, &c.—W. E. Jefferson and E. Lee, F. E. A. Busche.

UMBRELLAS, Parasols, &c.—W. T. Parr, S. E. Carlisle (com.), W. L. Wise (com.).

UPHOLSTERY.—E. Hooke, W. Bodill, R. B. Evered, W. R. Lake (com.).

VALVES, Taps, Stop Cocks, Plugs; Regulating the Flow and Pressure of Fluids.—J. W. Midgley, J. D. Churchill, H. J. Harman, E. Edwards (com.), G. Fletcher (com.), G. Low and E. J. Davies, J. Aird, J. W. Lamb, P. D. Reynolds, W. R. Maguire, A. Cole, D. J. Fleetwood, P. Keppie.

VELOCIPEDES, Bicycles, &c.—M. H. Gerring and R. E. Rumsey, T. Humber, T. R. Marriott and F. Cooper, J. H. Walsh, H. J. Lawson, J. Symes, J. Liedman and C Beyer, H. Homan, J. Turner, J. Goodman, H. Whitehead and J. Snow.

VENTILATION: Supplying and Purifying Air for Buildings, Mines, Ships, Carriages, &c.—O. Sheppy, A. M. Clark (com.), M. Stobbs, B. Morton, W. Wilson, W. R. Lake (com.).

WASHING, Cleansing, and Wringing Fabrics, Yarns, and Materials.—W. L. Wise (com.), E. Taylor, J. Hawthorn, W. E. Partridge.

WATER-CLOSETS, &c.—A. Cole, P. Keppie.

WATERING, &c.—J. Chidley, J. Hayes.

WEAVING, Braiding, Plaiting, Preparing for Weaving.—D. Marcom, C. F. and E. Barslem, J. Stansfield, A. Hitchon, W. Glover, J. Holding, H. Tetlow, J. and J. Lees and H. Travis, G. D. Sykes.

WOOD and Veneer.—F. H. F. Engel (com.).

*** *The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.*

A GLYCERINE BAROMETER.

A glycerine barometer has been suggested by Mr. James B. Jordan, and is being tested at Kew. The cistern is a cylindrical vessel of copper lined with tin, five inches deep and ten inches in diameter, fitted with a screwed cover, the air having access through a small hole in the cup attached to the cover, which has a recess holding cotton wool for filtering out the dust. The main tube, twenty-seven feet long, is connected with the cistern by attachment (with a soldered joint) to a projecting piece of tube which enters the cistern through the bottom, and is fitted at its opening with a screwed plug. The tube is an ordinary piece of metal gas pipe five-eighths inch in diameter, furnished at the top with a gun-metal socket, into which is cemented a glass tube four feet long, with an inside diameter of one inch, terminating in an open cup, and fitted with an India-rubber stopper.

The fluctuations of the level of the column of glycerine are observed and read off on brass scales placed on either side of the tube, and fitted with indices and verniers moved by mill heads at the bottom of the scales. One of these scales gives the length of the column of glycerine, the other the corresponding length of a column of mercury. A variation of a tenth of an inch in a mercurial column is shown by a change of more than an inch in the glycerine column, and the latter is therefore expected to show minute variations which are imperceptible in the former Glycerine absorbs moisture freely when exposed to the air, but this is prevented in the new barometer by covering the exposed surface in the cistern with a layer of heavy petroleum oil specially prepared.

A PROBLEM OF THE FUTURE.

ONE of the greatest difficulties brewers will have to contend with when the use of unmalted grain is allowed, will be to sustain the vitality of their yeast. By germination some of the albumenoid constituents are rendered soluble, and therefore worts made with unmalted grain will be deficient in albumenoids compared with those made with malt alone. As some kinds of grain, wheat for example, are richer in albumenoids than others, it will be the object of the scientific brewer to so arrange his grists that the resulting worts contain a proper proportion of albumenoid constituents, otherwise his yeast will gradually become weak and exhausted. This will be one of the many and difficult problems which will arise from the proposed new state of things.—*Brewers' Guardian.*

Correspondence.

EXPLOSIONS IN COAL MINES.

TO THE EDITOR

SIR,—Would you kindly admit a suggestion from a great dunce in science, though the suggestion may be a very impracticable one? When gas is generated in retorts is it not admitted into large reservoirs, and then through pipes laid on to wherever required? Would it be possible in coal mines where gas is generated without retorts to find means "in the pits" to receive that fatal gas into reservoirs, or receivers, &c., and then through pipes or tunnels laid on "up the shaft" to bring it into large reservoirs near the pit's mouth? I am not thinking about what the gas might do (I am told it is good for nothing as a wrong sort), but what could be done to save explosions in the pits, and whether "in the pits" underground, instead of above ground, something could not be managed. If my idea be absurd what a blessing science might render if a practicable scheme could be thought of to save our poor colliers.—I am, sir, yours, &c.

H. B.

Reviews.

SANITARY ENGINEERING.

"Sanitary Engineering, with Special Reference to the Sanitation of London Houses" By Messrs. INNES and BURTON, Consulting Engineers, 7, John-street, Adelphi, London, W.C. London: Printed by W. Trounce, 10, Gough-square, Fleet-street.

THE title of this pamphlet refers to one of the most important matters of the day, as everyone will doubtless admit without question Those who are called upon to have recourse to the services of the sanitary engineer will doubtless find hints and suggestions of value; though truth compels us to state that the work is evidently a professional prospectus.

HYDRO-INCUBATION.

"Hydro-Incubation, in Theory and Practice, a Guide to Commercial Poultry Farming. By THOMAS CHRISTY, F.L.S. Sixth Edition London: Christy & Co., 155, Fenchurch street, E.C., 1880.

ARTIFICIAL hatching of poultry cannot be said to be a new idea, for not only has it been known and practised with success from ancient days in Egypt, but it has been adopted in this country for some time past. But though not now to be classed as a novelty, yet it is so far modern that the practical elucidation of its nature and character cannot fail to be of interest, especially when such an expert as Mr. Christy is the elucidator, and we give him credit for saying no more than the truth when he states that the continued call for further information on Hydro-Incubation constrains him to put forth a new edition of his hints on this and kindred subjects, though, as he remarks, to use his own words, when I first called attention to the matter, few were disposed to look upon it in a practical way, rather regarding incubators as ingenious toys.

Year by year, however, its real utility has more firmly established itself; the obstinate adherents of unassisted Nature see themselves beaten in the race of commercial success by more ingenious and progressive minds; and no voice is heard in opposition, save that of a few ancient theorists who cannot afford to admit their error, and who instead act the part of one of those troublesome hens—for whom they are special pleaders—which cannot be made to sit, but disturb everything by their useless agitations and unproductive clucks

The time has now come when farming must be carried on in a more severely commercial and scientific spirit. Commissions on agriculture will do little, so long as farming is conducted in the happy-go-lucky way which has prevailed on small and medium-sized farms. In these trying days the only men who can maintain their position are the proprietors of very large farms, whose capital allows them to procure every means of diminishing labour and stimulating productiveness. But it would be a matter for regret if there were nothing but great farms. The smaller farmers are a very valuable class of the community. But it is certain that they must perish unless they extract from their farm everything it is legitimately capable of. Who can see the irregular hours of the labourer, the lounging work, the choked dishes, the abounding weeds, together with the infrequent supervision of the farmer, who sometimes knows more of the next meet or coursing party than he does of his stock-yard, without discovering one great cause of agricultual depression? If medium-sized farms are to continue, a new energy must be thrown into them. Farmers must give the same undivided attention to their business which is given by men in every other profession. They must give that energetic labour which was given by the old-fashioned farmer, together with that scientific attention which has only lately become possible, owing to the diffusion of knowledge by the weekly periodicals on each subject. Who would grudge a *Live Stock Journal*, when it can be delivered to your own door for 3½d. ? The proprietors secure the highest talent, and anyone in doubt on a subject can, by writing to the editor, get the best opinion as to how he should act in regard to any stock on his farm. In the north of England the services of Mr. E. Brown, of Newcastle, were secured by several gentlemen connected with "The Fancy," who could not find space in the *Live Stock Journal*, and they started the *Fanciers' Chronicle*, under Mr. E. Brown's editorship. In these pages will be found suggestions in many practical matters, and from time to time I shall call attention to the various improvements which may arise. Some it will be found are of more especial value in other parts of the world, and my intimate acquaintance with foreign lands justifies me in offering suggestions which would be impertinent in a mere theorist. But one thing I shall continue to do, *i.e.*, be ready to receive instruction from any quarter from which it may come, and frankly to acknowledge an error when it has been discovered.

In this edition I produce facts showing what is being done commercially in France, Egypt, and India, and I can now also add, in Greece. England has not been stationary, for many farmers and families with small areas of land are doing good work in extending largely their poultry operations It would be wrong to say that everyone succeeds in hatching or rearing artificially. I have known of some entire failures, but they are certainly not one per cent. Others who failed in their first attempts soon found out the mistakes they had made.

The work is divided into several heads:—1. The Theory of Hydro-Incubation. As regards public results, caponing and poultry farming, origin of the hydro-incubator, hydro-rearing mothers, Egyptian system of artificial hatching, how to choose the position for a hydro incubator. 2. The practice of Hydro-Incubation Instructions for working a 90-egg hydro-incubator, useful hints for beginners means of boiling water, the 250-egg hydro incubator, the 50s. cheap hydro incubator, the clucker, the drying box, rearing artificially—the hydro-rearing mother, the open-air rearer, the "1880" rearer, the syphon mother and drying mother, feeding young chicks; fattening poultry—the fattening pen, French cramming machine, egg testing—the use of the tell-tale, hints on eggs for sitting purposes. 3. Commercial Poultry Farming: Prices and general information, poultry dressing for market, caponing and poultry manure; French breeds of poultry. 4. Results of Hydro-Incubation: Hemel Hempstead tournaments, official reports of public trials at five more shows, particulars of work done with hydro-incubators and rearers.

The work is well illustrated by engravings and is in every respect a practical and reliable work.

SIX LECTURES ON PHYSICAL GEOGRAPHY.

"Six Lectures on Physical Geography." By the Rev. SAMUEL HAUGHTON, F.R.S., &c., Fellow of Trinity College, and Professor of Geology in the University of Dublin. Dublin: Hodges, Foster, and Figgis, Grafton-street. London: Longman, Green and Co., Paternoster-row. 1880.

THIS interesting work forms the substance of lectures delivered in 1876, and they are now published with some additions to the lectures as actually delivered.

Six lectures were delivered, and they are divided under distinct heads. To show the comprehensiveness of the lectures we give the title of each.

Lecture I. The Past History and Future Prospects of the Globe on which we Live.

Lecture II. Continents and Oceans, Volcanoes and Mountains.

Lecture III. The Law of Climate, Atmospheric and Oceanic Circulation.

Lecture IV. The Rivers and Lakes of Europasia.

Lecture V. The Rivers and Lakes of Africa and South America.

Lecture VI. The Geographical Distribution of Animals and Plants.

The work is well illustrated, and deserves the attention of all who take interest in Physical Geography, and to students especially it will be found very valuable.

ON A NEW SYSTEM OF PHOTOGRAPHY.

BY L. WARNERKE.

WHEN experimenting with various phosphorescent substances it occurred to me to apply it to photography, and the following are the results obtained up to the present moment:—

I prepare a phosphorescent plate, either rigid or flexible, by applying phosphorescent sulphide of calcium, either in the form of paint or powder, to the surface of glass or paper. The coating must be very smooth and uniform. Several substances can be used to cement the powder. Balmain's paint answers fairly well, but I suggest that albumen may be found more suitable, because it forms, when mixed with phosphorescent calcium, a coagulum which protects the phosphorescent material from the destructive action of the atmosphere (carbonic acid and moisture) more effectually than anything else.

A glass may be coated with collodion and a luminous surface formed on it. The film may be stripped off, and this will be found to be the best process by which to produce a smooth plate.

The plate so prepared, and previously kept in the dark, is inserted in the dark slide and exposed in the camera. After exposure it is removed to the dark room and put in contact with a sensitive collodion or gelatine dry plate. After suitable exposure by contact the sensitive plate can be developed and gives, as the result, a negative with perfect gradation, but reversed.

Theoretically, instantaneous exposure in the camera should be sufficient to give the requisite impression to the phosphorescent surface; and, if this surface could be produced sufficiently fine and smooth, it would be so practically. However, a few seconds' exposure with bright light is sufficient to render the luminous image easily discernible in the dark.

There is, besides this, the means of allowing a great range of exposure in the camera; since if the luminous image be not strong enough, prolonged exposure of the sensitive plate in contact with it will correct the shortcoming. By warming the plate bearing the luminous image the luminosity will instantly be increased, and there will be a corresponding effect on the sensitive plate.

The luminous impression, as shown in my previous paper on actinometers, is persistent, and this allows several negatives to be obtained from one luminous plate. By this means it is observed that contact printing is unsatisfactory for want of, or by too much, exposure; it can easily be remedied without the necessity of giving another exposure in the camera.

There is, however, a certain particularity which must be taken into consideration—the luminous image is not sharp. I repeated my experiments in regard to this fifteen times, and I came to the conclusion that the phosphoro-chemical focus is far away from the corrected focus of our lenses.

When once impressed the plate will remain luminous for many hours; but the luminosity can be extinguished by exposing it again to the light filtered through certain coloured transparent media. Respecting this I may remark that the most suitable extinguishing substance can only be found by actual experiment. I had several sorts of red and ruby glass, and only two of them acted as an extinguisher, but required an exposure of ten minutes to the sun's rays.

I found a green aniline colour dissolved in collodion or gelatine more serviceable The exposure of two minutes to diffused daylight was sufficient to complete the extinction. Strange enough, I have green glass of exactly the same green colour, but it does not act as an extinguisher.

I may mention here that by exposing the phosphorescent plate behind a negative a negative luminous image is obtained which can produce a positive on the collodion sensitive plate put in contact with it, and in this case it will be quite sharp.

If the phosphorescent plate be exposed to the light, and then put in contact with a negative covered with an extinguishing medium, and again exposed to the light, the opposite result to that previously described will be observed.

By using a phosphorescent plate it is possible to obtain a photograph of the red end of the spectrum To do this the plate is exposed entirely to the light; and when the spectrum is projected on it the rays of low refrangibility will extinguish the excited luminosity of the plate, leaving the lines of the spectrum luminous. This is printed on the gelatine or collodion plate.

The negative passed round for inspection was made under the following conditions —The phosphorescent plate was exposed in the camera for one minute, using a rapid rectilinear lens The light was of medium quality. A gelatine plate was put in contact with the luminous image for five minutes.—A communication to the Photographic Society of Great Britain.

LUNAR CAUSTIC FOR PURIFYING SPIRITS.

ALTHOUGH some sort of spirits are associated in our minds with lunatics, and others with "moon-shiners," the subject of which we are about to speak is of a quite different nature, being at once scientific and practical.

Berlien has discovered the fact that raw spirits can be purified by treatment with a solution of nitrate of silver and subsequent rectification. From two to two and a half parts of dry nitrate of silver are sufficient for one million parts of crude spirits, a ten per cent. water solution being employed The odour is entirely removed from the worst quality of crude spirits by this infinitesimal amount of silver; a good quality of raw spirits requires correspondingly less, and a one per cent. or a one-hundredth per cent. solution of silver is then employed.—*Scientific American.*

RECENT AMERICAN AND FOREIGN PATENTS.

Messrs William H. Burden and Frederick C. Burden, of Cleveland, Ohio, have invented an improved car axle journal oiler which is simple and effective. It consists of two conical wheels connected by a square shaft, and pressed against the journal by a spring contained in the journal box. An endless chain is suspended from the shaft and extends into the oil in the journal box.

Mr. John U. Mueller, of Detroit, Mich., has patented an improved jetty shutter. The invention consists of one or more rows of piles, driven some distance apart somewhat back from the line of breakers and on the line of the intended improvement, said piles being securely connected some distance above water level with longitudinal beams, and further stiffened and secured by braces and ties, while fastened to the inner longitudinal beams are the shutters, which are intended to form a settling basin for the mud, sand, clay, gravel, &c., driven by the waves toward the shore.

Messrs William P Woodruff and Charles H. Woodruff, of New York city, have patented an improved elastic packing for piston rods and other rods that slide through stuffing boxes. It is so constructed as to retain its elasticity when pressed down by the gland. It is formed of a central core of metallic turnings, surrounded by a layer of cloth and alternate layers of anti-friction metal and brass in the form of narrow strips wound spirally upon the cloth-covered core, and in the combination, with such packing rings, of an anti-friction metal seat, having a large ring grove in its upper side and two or more small concentric ring grooves in its lower side.

M. Eugene H. Angamar, of New Orleans, La., has pateeted a boiler adapted for application to horse cars without material changes. The invention consists in a boiler made in two portions, separated by a mediate chamber, the water and steam spaces of the parts being connected by pipes.

Messrs Lewis H. Raymond, of New York city, and John Roberts, of Dunellen, N J, have patented a life raft made with sides of equal height below and above the floor, and having independent cylindrical air chambers fastened thereto between the seats above and below the floor, and also having air chambers, made in compartments, formed between the sides at both ends of the raft. The gunwale on the top and bottom of the thwarts is held and braced by means of braces connecting the gunwale and the thwarts

Mr. Christian J B Hirsch, of Zumbrota, Minn., has patented an improved pipe stem The object of this invention is to furnish a short pipe stem which shall have the effect of a long one, cooling the smoke and allowin nicotine to condense from the smoke.

An improved hanging lamp, patented by Mr. Otto F. Eichberg, of New York city, consists in combining with a cup perforated at the top, and forming an extension of the tube, an adjustable extension having an interior depending flange and exterior absorbent

Mr John S. Birch, of Orange, N. J., has patented a novel key ring, so constructed that keys and other articles can be conveniently placed upon and removed from it, and which will not be liable to become opened accidentally. The invention consists in constructing the key ring of a strip of metal bent into V form, with rounded angle, having its end parts bent inward and outward to form shoulders, having one of its ends longer than the other and bent into U form, and having a lug upon one end and a recess in the other end.

Mr. Augustus J. Kuhn, of Lewistown, Pa., has patented an improved drying apparatus, intended more particularly for drying sand, which, by its peculiar nature, is difficult to dry and inconvenient to handle; but this improved machine may be used to advantage in drying any material that will run through the machine. The principal objects of the invention are, first, to permit the use of exhaust steam for producing the drying heat; second, to save handling of the material from the time it is placed in a wet condition in the machine to its delivery in a dry condition; and, third, to permit the regulation of the feed and delivery according to the heat and condition of the material and to prevent clogging of the feed.

Mr. Jesse M. Harr, of Baltimore, Md., has patented improvements in that class of skylights which are made strongly and studded with thick glass discs and placed in the side walk for the purpose of illuminating the dark recesses of a cellar or vault without allowing the entrance of rain and without breaking up the continuity of surface or weakening the pavement of such points.

Mr. John F. Henderson, of Franklin, Ky, has patented an improved coffee pot designed to more thoroughly extract the strength of the coffee and without boiling A pendent cylindrical water receptacle is placed in the top of the pot, and is provided with a straining sack below, in which is contained the ground coffee.

In preserving fruit, vegetables, and meats by what is known as the "refrigerating" process, a current of air of reduced temperature is, in many instances, forced into and through the chamber or receptacle containing the substances to be preserved. In other cases the air is drawn from a well or through a tube passing through a cellar, the current being established and maintained by the rarefaction of the air in the preserving chamber. Mr Louis G. Volkmar, of New York city, has patented a portable apparatus for use in drying fruit, &c., by means of a cold air current, which is conducted through a tube that traverses an ice box, and is so arranged therein that ice may be packed around and in contact with it.

An efficient and powerful implement for raising stumps, roots, rocks, and other objects, has been patented by Mr. William H. Wright, of Belmont, N H The invention consists of a vertical U-shaped frame in which moves a ratchet bar, the frame being provided with a lever for lifting the ratchet bar, a latch for retaining the bar at the point to which it is lifted by the lever, and springs for throwing the latch in and out of engagement with the ratchet bar

THE ZOOLOGICAL SOCIETY.

JUNE 1 —Prof. W. H. Flower, President, in the chair.—Mr. Sclater made some remarks on the principal objects he had noticed during a recent inspection of the Zoological Gardens of Berlin, Hamburg, Amsterdam, the Hague, and Antwerp.—The secretary exhibited a spider of the genus Tegenaria, taken within three miles of Cape Town, on the back of a horse, which had subsequently died, it was said, from the effects of the bite.—Mr G. E. Dobson exhibited some new and rare species of bats, and made some further remarks as to the date of the receipt of the dodo bones exhibited by him at a former meeting—Lord Lilford exhibited and made remarks on some nests and eggs of the flamingo, taken in the marshes of the Guadalquivir, below Seville, in April, 1879. He also exhibited hybrid pheasants, between males of Reeves's pheasant and hens of the common pheasant.—Papers were read by Mr. E W. H. Holdsworth on the distribution of the crayfish (Astacus) in Spain; by Prof. F. J. Bell, on some species and genera of the Temnopleuridæ, in the course of which he described the method he had adopted in comparing different species, and species at different stages in growth; he also directed especial attention to the differences in the size of the generation pores in *Amblypneustes formosus*, and discussed the specific characters of *Salmacis globator*; from Dr. A. Günther, on a collection of mammals from Japan; by Mr. G. E. Dobson, on a new species of bat, of the genus Natalus, from Jamaica, which he proposed to name *N. micropus*, and by Mr. A. W. E. O'Shaughnessy, on a new species of lizard, of the genus Uromastix, from Zanzibar, which he proposed to call *U. princeps*.

ADVERTISING COVER FOR THE "SCIENTIFIC REVIEW."

It was intended that the present number should have been published with a cover in which the Advertisements would appear. Circumstances have prevented this; and a Specimen Cover to be hereafter adopted can be had by Advertisers or others on application.

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President, SIR ANTONIO BRADY.

THE SESSION 1879—1880
IS ENDED.

The Balance Sheet 1879-80 can now be inspected.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

Proceedings of the Institute

The Institute being out of Session, there is no business to report.

Monthly Notices.

Les Mondes gives, from some source not specified, an account of a so-called electric girl, living at London, in Canada, whose hand cannot be touched save on penalty of an electric shock. She can give a violent shock to a chain of fifteen or twenty persons who join hands, and she has the power of magnetic attraction. Packets of needles, even if wrapped up in paper, hang suspended from her finger-ends. If she enters a room all the persons present undergo a perceptible influence; some are made drowsy, and others feel indisposed and enervated until her departure. A sleeping child awakes at her approach, but a slight caress with her hand sends it to sleep again. [How, when her touch communicates an electric shock?] Animals are equally influenced by her; a favourite dog of the family remains for entire hours at her feet, as motionless as if dead. Very strange, if true.—*Journal of Science.*

Royal Society.—Among other papers read before the Royal Soociety are—"Notes of Observations of Musical Beats," by A. J. Ellis, F.R.S., &c.; "The Aluminium Iodine Reaction," by Dr. J. H. Gladstone, F.R.S.; "On the Critical Point of Mixed Vapours," by James Dewar, F.R.S.; "Experimental Researches on the Electric Discharge with the Chloride of Silver Battery," by W. De la Rue, D.C.L., F.R.S., and Dr. H. W. Müller, F.R.S.; and "On the Lowering of the Freezing-point of Water by Pressure," by James Dewar, F.R.S.

The Revival of the Medical School at Oxford, which is now practically in abeyance, is the subject of a petition from the medical profession to be presented to Parliament shortly.

Substances possessing the Power of developing the Latent Photographic Image is the subject of a communication by Mr. Carey Lea, of Philadelphia, to the American Philosophical Society. The most active agents were found to be the borate, phosphite, sulphide, and oxalate of iron respectively, dissolved, the phosphate in neutral oxalate of ammonium, and the others in neutral oxalate of potassium.

A "spark tube" for detecting inflammable gas in collieries was recently brought before the Manchester Geological Society by Dr. Angus Smith. Producing ignition by the compression syringe is well known. Into a tube similarly arranged, the bottom of it being of strong glass, some spongy platinum was placed. The syringe was filled with air in any suspected place, and the piston, being driven home powerfully, ignited the gas if any were present. By this instrument 2½ per cent. of marsh gas had been detected.

Artificial Indigo.—Prof. Baeyer has discovered and patented the method of obtaining artificial indigo, which is to be worked on a commercial scale by the Baden Aniline Company. The indigo is obtained from chloride of isatine, which is produced from benzoic - *Athenæum.*

The beautiful scarlet iodide of mercury appears quite white when viewed by the yellow light of the flame of sodium, according to Herr von Juptner's communication in the *Chemiker Zeitung.*

The thermo-electric pile of Melloni, according to M. Exner, in a communication made by him to the Vienna Academy of Sciences, is dependent on chemical as much as on thermic action. No current, he states, is generated if a pair of bismuth and antimony is plunged into nitrogen gas, whatever may be the temperature to which the junction is raised. The same result is obtained with many other metals. Not heat only but chemical action must be brought into play to generate an electric current.

The Density of the Vapour of Iodine.—L. Troost asserts that the density of the vapour of iodine decreases as well at low as at high temperatures. All the hypotheses which have been formed, based either upon a dissociation of iodine or upon an isomeric change, appear to him not very admissible. In the present state of our knowledge nothing warrants us to suppose that a partial vacuum suffices to produce a modification of this nature. The only consequences which necessarily flow from the experiments made at high temperatures or at low pressures, are that the coefficient of the expansion of iodine is variable with the temperature, and that its coefficient of compressibility varies with the pressure. All the hypotheses proposed to explain these results should take this double variation into account.

The Scientific Review
AND
SCIENTIFIC AND LITERARY REVIEW,
A RECORD OF PROGRESS IN
ARTS, INDUSTRY, AND MANUFACTURES.
INCORPORATING THE
JOURNAL OF THE INVENTORS' INSTITUTE.

AUGUST, 1880.

EDUCATION AND INDUSTRIAL PROGRESS.

"SAVE us from our friends" is a well-known saying of old which seems likely never to lose its pertinency. Certainly as regards the professed friends of education of the present day, this aphorism loses not a jot of its aptitude of application, for nearly all those who stand forward as advocates of public instruction are entirely possessed with the idea that education is essentially a matter of book learning, and although they may be led by the movements of the day to give some heed to the dissemination of that kind of knowledge which can be gathered up without books, and as to which books are merely records of its progress, yet any attention they may thereto give is utterly devoid of that earnest appreciation of the necessity for the spread of the knowledge of things around us, which is the prime requisite for the advancement of real useful learning. That this should be no matter of surprise will be evident off-hand to all who remember, that until recent times, those persons who were deemed scholars issued forth from our ancient universities with craniums well stored with Greek, Latin, grammar, logic, and mathematics of the abstruse kind, and, as a polish to these, poetry and fiction derived from the works of modern authors of eminence were conjoined; hence, those who possessed much of this kind of knowledge were deemed learned men. Now, as some of the principal men belonging to our public press have been thus educated, it is not to be wondered at, that when writing on education they favour the spread of such knowledge as we have adverted to, and that their views are of course helped on by their subordinates. Common sense will hence teach us to expect that men who have not had the advantage of much education of any sort,—from which class the foremost of our busy men in State and Municipal affairs are drawn, —echo the sentiments of the public writers,—and that so it comes to pass that all education is made to consist of an affair of books and cram, whilst the intelligent—even scientific—pursuit of a handicraft or a technical avocation, however important, is made to stand outside the educational category. So that a youth who may be very ill fitted by brain formation to receive and assimilate strictly literary knowledge, is compelled to *waste* (we use the word advisedly) some of the best of his early years in the fruitless task of attempting to become a man of literary culture, not being allowed to use his time in any other way until he has satisfied the mighty idol Cram by proving himself equal to the requirements of his "standards."

Such a system as this is mere moonshine and rubbish, being simply one of the illustrations of the old endeavour to pack round men into square holes and square men into round holes. And if the defence of the system be that it is as regards the general effect on the country at large, good, this can surely never be seriously maintained by any thoughtful and truthful person, for in no case can it be desirable to keep the children of the people from commencing the practice of the arts of civilization till they have arrived at an age when the early training becomes irksome and difficult, simply because they have not mastered some niceties of grammar or other general school learning. It would be just as wise to prevent a child from practising singing, or making the first efforts to play on a musical instrument until he had previously become well acquainted with the science of music!

Now that we have a government which is said to be of a more popular character than any that has preceded it, one might well hope to find that instead of the absurd educational nostrums we have referred to being insisted upon, more enlightened ideas would prevail; but, as a matter of fact, such a hope one may almost reckon as forlorn; for the School Board system, notwithstanding its incidence of overburdening taxation, which, however, does not fall directly on the working classes, is supposed to be in great favour with those classes; therefore a popular government must, of course, take care to carry out school boardism to the letter. In fact, if the good pleasure of Demos be worth securing, it should be rendered more exacting and stringent, so that that word Compulsion, so dear to modern men of liberty, may always accompany education without regard to its essentially good or evil effects on the community.

But untoward as the aspect of the case appears, there is one ray of hope which cheers us with the thought that better counsels may yet be followed. We now have connected with the Government Education Department the Right Honourable Mr. Mundella, M.P., and as he is practically acquainted with the importance and necessity of industrial progress, we trust that he will bring about such modifications in our educational system as shall advance real technical instruction whether in its scientific or practical phases, so that practical science may be mightily advanced to the great benefit of our age and country. To do this, general learning need be by no means depressed, but on the contrary be still in a position of high estimation.

Proceedings of Societies.

ROYAL SOCIETY.

May 27 —The President in the chair.—The following papers were read:—On "Some Thermal Effects of Electric Currents," by Mr. W H. Preece; "A Preliminary Account of the Reduction of Observations on Strained Material, Leyden Jars, and Voltameters," by Profs. Ayrton and Perry; on "The Structure and Development of the Skull in the Batrachia," Part III., by Mr. W. K Parker, F R S., on "The Relation of the Urea to the Total Nitrogen of the Urine in Disease," No. I, by Dr. W. J. Russell, F.R S., and Mr. S. West, on "The Amount of Nitrogen excreted in the Urine of Man at Rest," No II., by Mr. S West and Dr W. J. Russell, F.R.S., on "The Artificial Formation of the Diamond," by Mr. J. B. Hannay, and "Further Note on the Spectrum of Carbon," by Mr. J. N. Lockyer, F.R.S.

June 3.—Annual meeting for election of Fellows.—The President in the chair.—The following were elected.—Prof J. Attfield, H. F. Blanford, T. Clifford-Allbutt, M.D., Rev. W. H. Dallinger, W. T. Thiselton Dyer, Lieut.-Col. H. H. Godwin-Austen, the Right Rev. C Graves, D D., Bishop of Limerick, Prof. D. E. Hughes, H. M. Jeffery, Prof. F. M'Coy, J. F. Moulton, Prof C Niven, J Rae, LL.D., Prof. J. E. Reynolds, M.D., and W. A. Tilden.

June 10.—The President in the chair.—The following papers were read:—On "A Fourth State of Matter," by Mr. W. Crookes; on "*Bacterium fœtidum*, an Organism associated with Profuse Sweating from the Soles of the Feet," by Dr. Thin, on "The Solubility of Solids in Gases," and on "The State of Fluids at their Critical Temperature," by Mr J. B. Hannay; "Note on the History of the Carbon Spectrum," and on "The Spectra of the Compounds of Carbon with Hydrogen and Nitrogen," by Profs. Liveing and Dewar, on "Certain Effects of Stress in Soft Iron Wires," by Prof. J. A. Ewing; and "Memoir on Abel's Theorem, with Addition by Prof. Cayley," by Mr. R C Rowe.

June 17. -The President in the chair.—The Right Hon. A. J. Beresford Hope was elected a Fellow—The following papers were read—"Notes of Observations on Musical Beats," by Mr. A. J Ellis; on "The Critical Points of Mixed Gases," by Prof Dewar, on "The Lowering of the Freezing Point of Water by Pressure," by Prof. Dewar, "The Aluminium Iodine Reaction." by Dr. Gladstone and Mr. A. Tribe; "Preliminary Note on the Ossification of the Terminal Phalanges of the Digits," by Messrs. E. A. Schafer and F. A. Dixey; on "The Organisation of the Fossil Plants of the Coal-Measures, Part XI," by Prof. W C Williamson; "Note on the Discovery of a Fresh water Medusa of the Order Trachomedusæ," by Prof. E. Ray Lankester, "Agricultural, Botanical, and Chemical Results of Experiments on the mixed Herbage of Permanent Meadow, Part II The Botanical Results," by Mr. J B. Lawes and Dr. Gilbert; "Preliminary Note on Some Points in the Pathology of Anthrax, with especial Reference to the Modification of the Properties of the *Bacillus anthracis* by Cultivation, and to the Protective Influence of Inoculation with a Modified Virus," by Dr. W. S. Greenfield; on "The Miocene Plants Discovered on the Mackenzie River," by Prof. O. Heer, on "The Electric Condition of the Terminals of a Vacuum Tube after the Connection with the Source of Electricity has been Broken," by Mr. W. de La Rue and Dr. Hugo Muller, on "The Constants of the Cup Anemometer, Part II.," by Rev. Dr. Robinson; "Note on the Bearing on the Atomic Weight of Aluminium of the Fact that this Metal occludes Hydrogen," by Prof. J. W. Mallet; on "The Spectrum of the Flame of Hydrogen," by Mr. W. Huggins; and on "The Spectrum of Water," by Profs. Liveing and Dewar.—The Society adjourned over the long vacation.

ASIATIC SOCIETY.

May 24.—Anniversary meeting.—Sir H. C. Rawlinson, President, in the chair.—The following were elected as the Council and Officers for the ensuing year, 1880-1: President and Director, Sir H. C. Rawlinson; Vice-Presidents, Sir E. C. Bayley, Sir E. Colebrooke, Bart., Sir R. Temple, and Col. Yule. Council, E. L. Brandreth, Major-General Dalton, Sir B. Ellis, J Fergusson, A. Grote, Col. Keatinge, General Sir A. Kemball, Lieut.-Col. Lewin, General Maclagan, Sir W. Merewether, Major Mockler, Sir W. Muir, Lieut.-General Sir H Norman, General Sir A. Phayre, Lieut.-General Sir H. E. Thuillier; Secretary, Mr W. S. W. Vaux; Assistant-Secretary, Mr. F W. Holt; Hon. Secretary, Mr. R. N. Cust; Treasurer, Mr. E Thomas.—The report of the Council was read, from which it appeared that fifty new members had been elected during the last year, against a loss by death of eight. Brief notices were given of Lord Lawrence, the Rajah of Beswan, Sir J. Low, C H. Damant, Capt. C J. F. S. Forbes, A. D. Mordtmann, and Prof. Schiefner, together with a general survey of the progress of Oriental Studies during the last year.

June 7 —Sir H C. Rawlinson, President, in the chair. -Mr. W A. Tyssen-Amhurst, M P, and Mr. H. Wills were elected Residents, and Messrs. T. Plowden, J. W Best, S. E. Peal and J. K Birch non-Resident, members Dr Abel read a paper on "The Origin of Language as traced through the Egyptian Tongue,' in which he pointed out that in the ancient hieroglyphical period the Egyptian language was to a large extent a language of homonyms and synonyms, in which many roots had a variety of meanings, while many meanings could be expressed by a great variety of roots. Dr Abel then compared this primitive stage of language with the late Coptic, and, finding the synonyms gone or replaced by distinct derivatives, came to the conclusion that language was only gradually developed to an intelligible state The general nature of this process divests it of much of its surrounding mystery, as numerous words are invented for every conception, or tentatively used by succeeding generations. A continuous choice must then have been made, until a sound most responsive to the national sense was fixed upon and more or less exclusively adopted. Each root had no doubt originally a variety of significations. Dr. Abel then proceeded to demonstrate two important facts in this gradual evolution of sense and sound, namely, the intellectual and phonetical inversion of roots. In Egyptian many roots, he remarked, mean one thing and its opposite too, and where there is no variation in sound, the context alone can decide which signification is required for the particular case In other words, two opposite notions, each expressed by separate words, are formed into a compound, denoting either one or the other of the two conflicting meanings.

NUMISMATIC SOCIETY.

May 20.—W. S. W. Vaux, Esq., V.P., in the chair.—The Hon. J. Gibbs and Dr. W. Pauli were elected members.—Sir A. Phayre exhibited a silver coin lately found in Pegu, said to be of the tenth or eleventh century The coin had on the obverse a conch shell with a crab inside it.—Mr Hoblyn exhibited an original warrant, dated February 14th, 1627, to Sir W. Parkhurst, Warden of the Mint, altering the value of certain gold and silver coins; also a selection of rare milled shillings from Elizabeth to George III.—Mr. Krumbholz exhibited a proof in gold of a Keepang piece of 1873 of the East India Company; also two rare Oxford pound pieces, of 1642 and 1644, and an unpublished variety of a twenty-shilling Scottish piece of Charles I., with the letter F under the horse's feet.—Mr. Copp exhibited a portion of a hoard of late Roman denarii found at a farm called Rheworthen Isa, near Aberystwith, Cardiganshire.—Mr. H. S. Gill communicated a paper on "Unpublished Seventeenth Century Yorkshire Tokens, with Contemporary Notes on some of the Issuers of Hull and other Towns." In the paper Mr. Gill described about fifty new types —Mr L. Bergsoe, of Copenhagen, communicated a paper, in which he discussed the place of mintage, &c., of certain coins of the Cuerdale find. These were the coins inscribed "Ebraice Civitas, Cvnetti,' and "Qventovici," and he attributed them to the towns of Evreux, Condé, and Quentovic respectively, three towns in the north of France, near the Scheldt. In the inscription "Cirtona Acrton" Mr. Bergsoe traced the name of Cnut Rex, and in Siefredvs that of a Danish chief. Mr. Bergsoe from these premises proceeded to argue that none of these coins was ever struck in England, but that the type of the English coin was adopted by foreign moneyers on account of the high estimation in which these coins were held.—General A. H. Schindler communicated a short paper on some unpublished Mohammedan coins acquired by him during a recent tour in Kerman (Caramania). These coins were for the most part struck by Abu Said Bahadur Khan, last Moghul emperor of Persia, and by Shah Rukh

LINNEAN SOCIETY.

May 24.—Anniversary meeting -Prof. Allman, President, in the chair--Following a few introductory remarks, the President referred to the sad loss during the year of such men as the late Prof. Bell, the veteran J. Miers, General Munro (famed for his knowledge of the grasses), Dr. D. Moore, of Dublin, Mr. W. Saunders, Mr. E W. Cooke, R.A, artist and naturalist, Mr. M Allport, of Tasmania, and Mr. T. Atthey, of Tyneside celebrity, a worthy Associate of the Society. Of foreign *savants* Prof. Brandt, of St. Petersburg, Dr Fenzl, of Vienna, and W P. Schimper, of Strasbourg, deserve mention—The Secretary then read his report, showing that since the last anniversary ten Fellows, three foreign members, and one Associate had died, and three Fellows had withdrawn On the other hand, twenty-eight new Fellows, three foreign members, and four Associates had been elected The library showed a marked increase in its usefulness, and considerable additions had been made by purchase, exchange, and donation. The evening meetings also had been unusually well attended during the session.—The Treasurer, in his report, pointed out that although the late commercial depression had more or less affected all the scientific societies, happily its effect on the Linnean was but transitory. At present the Society is quite free of debt, has an invested capital of £3,730 12s. 8d, and the balance at the bankers' and in hand at this date is £522 18s. 2d. Since 1875 the invested capital has been doubled, and this in spite of the extra working expenses being much increased since the Society occupied their rooms at Burlington House.—The Fellows thereafter proceeded to ballot for the Council and Officers. Five of the Council retiring, as customary, there were elected in their places Messrs. E. R. Alston, G. Bentham, G. Busk, Dr. M. Foster, and Mr. B. D. Jackson. For the Officers, Prof. G. J. Allman was re-elected President; Mr. F. Currey (the outgoing Secretary), Treasurer; Mr. E. R. Alston, Zoological Secretary; and Mr. B. Daydon Jackson, Botanical

Secretary.—The President then read his anniversary address, taking for his subject "The Vegetation of the Riviera: a Chapter in the Physiognomy and Distribution of Plants."

June 3.—Prof. Allman, President, in the chair.—The Secretary read a paper on "The Specific Identity of *Scomber punctatus*, Couch, with *C. scomber*, Linn.," by Dr. F. Day. The specimen on which this observation has been made was captured on the coast of Cornwall in April last.—In a note on the anal respiration in the Zoea larva of the Decapods, by Mr. M. M. Hartog, he shows from an examination of living larvæ of Cancer that the terminal part of the rectum is slightly dilated, and possesses a rhythmic contraction and expansion duly associated with opening and closing of the anus. A clue to the ultimate transference of bronchial respiration may perhaps be found in the Entomostraca, where, in certain forms, food is obtained by a current from behind forwards, due to the movement of the setose or flat limbs immediately behind the mouth. Prof. Claus has shown that in Daphnia the latter processes have a respiratory function, while this animal possesses a mell-marked anal respiration.—Mr. G. Murray made a communication on "The Application of the Result of Pringsheim's recent Researches on Chlorophyll to the Life of the Lichen." Summarising Pringsheim's labours, and taking into consideration the views of Vines, Geddes, and Lankester, Mr. Murray arrives at the conclusion that we have in lichens fungal tissues, as the body of the thallus and the chlorophyll screen in the gonidial layer; that is, the chlorophyll is in one system of cells and the protoplasm apparently affected by it in another which is in contact. The light which traverses the chlorophyll-containing gonidial layer excites in the fungal tissues the decomposition of carbonic acid.—Mr. P. H. Carpenter, in giving the result of some researches of his on "The Genus Solanocrinus, Goldfuss, and its Relations to recent Comatulæ," stated that Schluter was perfectly justified in uniting Solanocrinus with Antedon. The latter author does the same with Comaster, though to Mr. Carpenter Goldfuss's description of this type appears to differ so much from all other Comatulæ that he prefers provisionally to regard it as distinct. Mr. Carpenter's observations on these crinoids are founded on a comparison of material from the Challenger Expedition with an extensive series of fossil forms, and he believes that variations in the development of the basals are useless as generic distinctions.

June 17.—Prof. Allman, President, in the chair.—The Rev G. B. Hunt, Mr. H. N. Moseley, the Rev. A. M. Norman, and Mr. E. A. Webb were elected Fellows. –Dr. Prior called attention to a rare case of a mistletoe parasitic on a mistletoe —Lord Lilford exhibited, and remarks were made on, a series of skins, skulls, and horns of the wild sheep of Cyprus (*Ovis ophion*, Blyth).—Mr. E M. Holmes showed an example of *Polysiphonia fastigiata* with its antheridia.—Preparations of the early stages of invertebrates from Naples and living specimens of the new fresh-water Medusa were exhibited by Mr. F Crisp, and the growing point of Chara and the common ash by Mr. C. Stewart.—A paper was read by Mr. F. M. Campbell on "Certain Glands in the Maxillæ of Spiders." These, probably, secretory in function, he finds in *Tegeneria domestica*, and they have apertures on the inner side of the upper face, thence inclining towards the mouth. They increase in number with age, and become chitinous. Glands apparently similar in kind he also finds in several families of the spiders.—Mr. S. O. Ridley contributed a paper on "Two Cases of Incorporation by Sponges of Spicules foreign to them." In one Ciocalpta the dermis contained spicules derived from a species of Esperia, and in the other example of Alebion similarly Esperia spicules had been fused with its own individual tissues.—Prof. Allman then called attention to a remarkable Medusa, recently discovered by Mr. W. Sowerby in the fresh-water tank containing the *Victoria regia* at the Botanic Gardens, Regent's Park. Prof. Allman described the specialities of this small but elegant organism, whose congeners are altogether marine in distribution. How the swarms could have come into or been developed in the tank remains conjectural; for no fresh plant has been put into the tank for some years, nor has any sea water been added, or other material likely to have contained ova been introduced. The name *Limnocodium Victoria* has been assigned to this creature by Prof. Allman.—Mr. T. W. Campbell read a second paper on "The Stridulating Organs of *Steatoda guttata* and *Linyphia tenibricola*," which are demonstrated to be possessed by both sexes.—Dr. G. E Dobson, in "Notes on *Aplysia dactylomela*," shows that there is difference of size and asymmetry of the right and left halves of the dental rows of the lingual ribbon, and he describes other structures appertaining to the mandibular plates.—Mr. G. Busk gave the results of his researches on the Polyzoa collected in the late Arctic expedition. He describes some new forms, and his determination of others differs from that arrived at by Prof. Smitt, of Stockholm.—In a paper on "The Natural Classification of the Gasteropoda," by Dr. J. D Macdonald, the author elaborates with modifications and additions views formerly promulgated by him.—The sixth contribution to the Mollusca of the Challenger expedition by the Rev. R. B. Watson was taken as read. The author treats of the Turritellidæ, and describes nine new species.—A paper by Sir J. Lubbock, containing further observations on ants, was read.

ENTOMOLOGICAL SOCIETY.

May 5.—T. Stainton, Esq., V.P, in the chair —Mr P. Inchbald was elected a member —Mr. W. C. Boyd exhibited a very pale specimen of *Nyssia hispidaria*, taken at Cheshunt —Mr M. J. Walhouse exhibited some Geodephagous beetles, which were found only on the summits of some of the highest mountains in India.—Mr W. L Distant exhibited a long series of specimens of the Madagascar homopteron *Ptyelus Goudoti*, Benn, to illustrate the extreme variability of the species The series showed a gradation from melanic to albinic forms, and one specimen was asymmetrical in the markings of the tegmina, thus exhibiting the character of two varietal forms, an occurrence which Mr. Distant stated was not altogether exceptional in extremely variable species of the order Rhynchota.—Mr T. R. Billups exhibited two living specimens of *Carabus auratus*, which had been found in the Borough Market.—In reference to a prediction by Mr. Wallace, that a sphinx moth would be found in Madagascar with a proboscis of sufficient length to reach into the nectary of *Anagræcum sesquipedale*, Mr. Pascoe stated that he had heard a rumour that such an insect had been discovered, and endeavoured, without success, to find corroboration of the statement from members of the Society.—Miss E. O. Ormerod made some remarks as to the contents of a work which she had edited and presented to the Society, and which contained the meteorological observations taken by Miss Molesworth for a period of forty-four years. Some attempt was made to contrast the meteorological conditions with the dominant phases of plant and animal life during that period.

CHEMICAL SOCIETY.

May 20.—Prof. H. E. Roscoe, President, in the chair.—The first paper was entitled on "The Action of Air upon Peaty Water," by Miss L. Halcrow and Dr. Frankland. In consequence of the statements of Dr. Tidy, in his paper on "River Water," as to the rapid oxidation of peaty matter in running water, the authors have studied upon an experimental scale the action of exceptionally strong peaty water upon atmospheric air. The authors concluded that if peaty matter is oxidised, the process takes place with extreme slowness.—Dr. Frankland then read a paper on "The Spontaneous Oxidation of Organic Matter." This was practically a criticism of the conclusions drawn by Prof. Tidy in his paper alluded to above. The author concluded that there is no evidence of the destruction by oxidation of the dead, still less of the living, organic matter in a river.—Prof. Tidy, in reply, pointed to the statistics of the last ten years, which proved that many towns which derived their water supply from river water which had been polluted with sewage were as free from fever, &c., as other towns supplied by deep well water.

June 3.—Prof. H. E. Roscoe, President, in the chair.—It was announced that a ballot for the election of Fellows would take place on June 17.—The following papers were read, on "Some Products of the Oxidation of Paratoluidine," by Mr. W. H Perkin; on "The Detection of Foreign Colouring Matter in Wine," by Dr. A. Dupré. The true colouring matter does not dialyze. All the artificial colouring matters except alkanet dialyze freely, so that cubes of gelatine jelly soaked in the wine for forty-eight hours become scarcely tinged below the surface if the wine is pure, but if coloured with magenta, &c., the cube is stained to the middle. Alkanet is easily recognised by its absorption spectrum; on "The Action of Organozinc Compounds upon Nitrites and their Analogues: I. Action of Zinc Ethyl on Azobenzine," by Messrs. E. Frankland and D. A. Louis: II. on "The Action of Zinc Ethyl upon Benzonitrile," by Messrs. Frankland and J. C. Evans; on "The Relation between the Molecular Structure of Carbon Compounds and their Absorption Spectra," by Prof. W. N Hartley The author has photographed the spectra of various substances; he concludes that no molecular arrangement of carbon atoms causes selective absorption or gives absorption bands unless three pairs of carbon atoms are doubly linked together in a closed chain. The most remarkable substance in this respect is anthracene, which, when diluted one in fifty millions, gives a considerable and distinct absorption; on "A Simple Method of determining Vapour Densities in the Barometric Vacuum," by Messrs. C. A. Bell and F. L. Teed. It consists of a modification of Hofmann's apparatus.—Mr. C. T. Kingzett made a verbal communication to the effect that he had recently investigated the question of the slow oxidation of moist phosphorus, and had obtained evidence that both ozone and hydroxyl were formed.

June 17.—Prof. H. E. Roscoe, President, in the chair.—The following papers were read: on "Pentathionic Acid," by Messrs. T. Takamatsu and W. Smith. The authors have examined the evidence for and against the existence of this substance; they conclude that it does exist, and give a new method of preparing it by the action of a very strong solution of iodine in hydriodic acid upon lead theiosulphate; "Preliminary Note on some Orcinol Derivatives," by Dr. J. Stenhouse and Mr. C. E. Groves. The authors have confirmed their previous conclusion that halogen derivatives of orcinol exist containing five atoms of bromine, &c., both the hydrogen atoms in the hydroxyl groups being displaced; on "The Determination of Carbon in Soils," by Messrs. R. Warington and W. A. Peake. Oxidation with potassium permanganate gives 92 per cent. of the total carbon, but digestion with chromic acid, &c., only 79 per cent. The best method is combustion with oxide of copper in a stream of oxygen; "Note on Camphydrene," by Dr. H. E. Armstrong. In this note the author sharply criticises a recent paper by Dr. Letts in the Berlin *Berichte*, and as a result of some experiments completely confirms the statement of Montgolfier that the substance formed by the action of sodium on the solid hydrochloride from turpentine oil is a mixture, and not a hydrocarbon having the formula $C_{10}H_{17}$, as asserted by Dr. Letts; on "The Action of Nitric Acid upon Diparatolylguanidin," by Mr. A. G. Perkin. Dinitrodiparatolylguanidin, melting at 205°, was obtained in red crystals, also by a slight modification dinitrodiparatolylurea, melting at 233°; on "Some Higher Oxides of Manganese and their Hydrates," by Mr. V. H. Veley. The oxide was precipitated by chlorine from a pure solution of the acetate, and was then heated in a current of air or oxygen hydrates Mn_6O_{11}, $2H_2O$, $2(Mn_6O_{11})$, $3H_2O$, and $Mn_{12}O_{33}H_2O$ were obtained, but in no case was the dioxide formed; on "A New Method of preparing Dinitroethylic Acid," by Dr. E. Frankland and Mr. C. C. Graham. This consists in passing nitric oxide into a mixture of zinc ethyl and sodium ethyl, to which a suitable solvent, such as benzene, has been added; on "The Action of Organozinc Compounds upon Nitrites and their Analogues," by Dr. E. Frankland and Mr. H. K. Tompkins. The action of zinc ethyl upon phenylacetonitrile is studied; on "The Action of Benzoyl Chloride on Morphine," by Dr. C. R. A. Wright and Mr. E. H. Rennie. The end result is always dibenzoyl morphine; "An Examination of Terpenes for Cymene by means of the Ultra-violet Spectrum," by Prof. W. N. Hartley. The author has examined specimens of orange oil, French turpentine, and Russian turpentine by photographing their absorption spectra; the first two oils were free from cymene, the last contains certainly less than 4 per cent.; "Notes on the Purple of the Ancients," by Dr. E. Schunck.—The Society adjourned over the summer recess.

METEOROLOGICAL SOCIETY.

MAY 19.—Mr. G. J. Symons, President, in the chair.—Messrs. T. H. Edmonds, F. Ekless, A. H. Taylor, and T. Turner were elected Fellows.—The following papers were read: "Variations in the Barometric Weight of the Lower Atmospheric Strata in India," by Prof. E. D. Archibald; "A Sketch of the Winds and Weather experienced in the North Atlantic between lats. 30° and 50° during February and March, 1880," by Mr. C. Harding. The period embraced in this paper includes the time during which the Atalanta was on her homeward passage, as she left Bermuda on January 31st. From the data collected it is shown that a gale blew in the Atlantic every day throughout the two months, excepting on February 21st and 24th to 27th. With especial reference to the Atalanta, it appears probable that she would not have met with any exceptionally severe weather earlier than about the 12th or 13th of February, and allowing that she had averaged from five to six knots per hour on her homeward course, she would at that date have inevitably encountered a severe hurricane. A heavy gale is noted on the 12th in 38° N and 45° W., which is in the direct homeward-bound track from Bermuda, and if the Atalanta had only averaged four knots per hour on her homeward course she would have fallen in with this gale. The storm of the 12th and 13th may fairly be considered as about the most severe during the two months here dealt with.—On "The Meteorology of Mozufferpore, Tirhoot, for the Year 1879," by Dr. C. N. Pearson.—Mr. D. Winstanley exhibited his solar radiometer.

JUNE 16.—Mr. G. J. Symons, President, in the chair.—Dr. T. W. Barry, Messrs. A. W. Martin and C. E. Peek were elected Fellows, and Senor A. Aguilar and Dr. H. H. Hildebrandsson honorary members.—The following papers were read: "Ozone in Nature, its Relations, Sources, and Influences, &c., from Fifteen Years' Observations, Ashore and Afloat, under all Conditions of Climate," by Dr. J. Mulvany. The meteorological elements with which ozone is most intimately associated are such as occasion high vapour tension and a high degree of saturation; therefore it is promoted by wind passing over a large aqueous expanse and by heat producing rapid evaporation. Hence heat, if humid, is no bar to atmospheric ozonisation; but no definite relation exists in the atmosphere between heat *per se* and ozone; its relation to humidity is more definite and direct, but subject to many exceptions; in consequence of this relation it most abounds where its chemical qualities render it most useful. It appears to be formed in the upper strata and to be carried downwards by raindrops, whose office is vehicular. The spherules of water which constitute clouds, and have their origin in radiation and condensation, have a similar office. Ozone does not appear to diffuse readily downwards, so that when the lower strata are robbed of ozone by jungle, &c., a considerable difference in the ozonic condition close to and at 170 feet above the surface may exist. The author is of opinion that no disease can be clearly traced to ozone as met with in the atmosphere.—On "The Average Height of the Barometer in London," by Mr. H. S. Eaton; "Note on a Waterspout observed at Morant Cays, Jamaica, March 23rd, 1880," by Lieut. A. Carpenter; "Account of a Balloon Ascent from Lewes in a Whirlwind, on March 23rd, 1880," by Capts. J. Templer and H. Elsdale; "Results of Meteorological Observations made at Stanley, Falkland Islands, 1875-77," by Mr. W. Marriott; "A New Thermograph," by Mr. W D. Bowkett; and on "The Winter Climate of Davos," by Dr. C. T. Williams.

PHILOLOGICAL SOCIETY.

MAY 21.—Anniversary meeting.—Dr. J. A. H. Murray, President, in the chair.—The Chairman read his annual address; Mr. H. Sweet read his report on late investigations into vowel-phonology by continental scholars; and Dr. R. Morris his report on Pali.—The following members were elected the Society's officers for 1880-81: President, A. J. Ellis; Vice-Presidents, The Archbishop of Dublin, Drs. Guest, Stokes, Morris, and Murray, and H. Sweet; Ordinary Members of Council, Messrs. E. L. Brandreth, Prof. C. Cassall, C. B. Cayley, R N. Cust, Sir J. F. Davis, F. T. Elworthy, H. H. Gibbs, E. R. Horton, H. Jenner, Prof. R. Martineau, Rev. J. B. Mayor, W. R. Morfill, H. Nicol, J. P. Postgate, Prof. C. Rieu, Rev. A. H. Sayce, Dean Scott, Prof. W. W. Skeat, H. Wedgwood, and Dr. Weymouth; Treasurer, B. Dawson; Hon. Sec., F. J. Furnivall.

JUNE 4.—Mr. A. J. Ellis, President, in the chair.—Mr. K. Spencer was elected a member.—The papers read were on "Aisle," by Dr. J. A. H. Murray, showing that the word, after having first had its Old French form in English, was confused with "ile," island, and spelt *ile*, and did not take its present form till Burke's time; on "Some Differences between the Speech of Edinburgh and London," by Mr. T. B. Sprague, such as *flesher* for butcher; *beast* for any animal, though as small as a lady-bird; *divider* for a soup-ladle; *house* for a flat, sixteen houses being in a "tenement" under one roof; *wrongous* (A.-S. *wrangwis*) for wrongful; *sort* the children, make them tidy; *soft* weather, showery; *presently*, at once, &c.; on "The Makua Language (one of the Bantu group, near Zanzibar)," by the Rev. C. Maples, a missionary and teacher. Dr. Bleek's sixteen "genders" or classes of the nouns with differing prefixes were completed, and the structure of the language explained. "Sister" was "female brother;" the original numerals went only up to five; the relative was wanting: "the man whom I saw" was "the man he saw [or "was seen," for there was no passive] my." The people were very kindly, clever, and interesting; very honest, but untruthful.

JUNE 18.—A. J. Ellis, Esq., President, in the chair.—Mr. W. R. Morfill read a paper on "Some Polabish Vocabularies." This language, belonging to the Slavonic family, became extinct in the earlier part of last century; a few lists of words, a song composed in it, some versions of the Lord's Prayer, &c., are all that remain. These vocabularies were examined at some length in the paper, and many interesting words cited. Some of the blunders made by the transcribers on account of their ignorance of Slavonic were also given. The labours of Schleicher and Hilferding were discussed. The former considered Polabish to belong to the Polish or Lechish (to use his own phraseology) division of the Western Slavonic family, Kashubish being the link between it and Polish properly so-called. To this branch its law of sound clearly assign it, especially the prevalence of nasals.—Mr. W. R Browne read a paper on "The Distributions of English Place-Names," in which he gave a table of the results obtained by examining 10,492 names in Dugdale's "England and Wales." The names were classified under sixty separate headings according to their endings. Those ending in *ton* formed nearly one-fourth of the whole, being 2,545, *ham* and *ley* came next, with 702 and 653 respectively; while 1,703 were placed under miscellaneous. The endings were roughly grouped according to their origin, whether English, British, or Norse; and remarks were made on some of them, where the distribution threw light on their meaning or was otherwise curious. Thus Mr. Kemble's theory that names ending in *ing* indicate the original seat of an English colony was apparently negatived by the fact that the ending is almost entirely absent in South Suffolk.—A discussion followed, in which the President, Mr. Sweet, Dr. Murray, Dr. Morris, and others took part, and which turned partly on the general principles of such classification, and partly on the meaning of particular endings, as *ham*, *ley*, *side*, *hope*, and *wick*.

INSTITUTION OF CIVIL ENGINEERS.

MAY 25.—Mr. W. H. Barlow, President, in the chair.—The last ballot for the session resulted in the election of six members, viz., Messrs. J. S. Chorlton, R. A. Cordner, T. Joseph, A. Ross, J. T. Smith, and J. T. Stewart; of eleven associate members, viz., Messrs. C. H. Cooper, H. Dorning, B. W. Flatt, T. P. Gunyon, W. Hill, S. Hownam-Meek, H. J. Oddie, W. A. H. de Pape, H. J. Saunders, R. J. H. Saunders, and H. H. Scott; and of Lieut.-Col. G. E. L. S. Sanford as an associate.

PHYSICAL SOCIETY.

MAY 22.—The annual holiday meeting of this Society was held at Cambridge, in the Cavendish Laboratory, under the presidency Lord Rayleigh. Vice-President of the Society.—Lord Rayleigh explained a mode of limiting the aperture of the spectroscope telescope so as to alter the angular interval with which it can deal. The angular interval is determined by a grating made by winding a fine wire round the threads of two parallel screws.—Mr. Shaw exhibited a modification of Veinholdt's apparatus for distilling mercury.—Mr. S. Taylor exhibited an apparatus for showing the motion of particles in a wave of water, and a modification of Herschell's manometric flame apparatus for showing sound waves.—Mr. Poynting described an apparatus for altering the plane of each half of the pencil of rays from a polariser.—Mr. Glazebrook described a modification of Wiedemann's plan for measuring the rotation of the plane of polarisation of light. — Lord Rayleigh showed a device for getting transmitted yellow light from a combination of red and blue solutions in a glass cell of a certain thickness. The solutions were chromate of potash and litmus. The same effect was also obtained by covering two pieces of glass, one with a coat of litmus in gelatine, and the other with a coat of chromate of potash and gelatine. Lord Rayleigh also exhibited an improved colour box, based on the principle of Newton.

GEOGRAPHICAL SOCIETY.

May 31.—Anniversary meeting.—Right Hon. the Earl of Northbrook, President, in the chair.—The following gentlemen were elected Fellows: The Earl of Kimberley, Lieut. A. H. Mason, Messrs P. Lloyd, J. Stedman, and W. A. Tyssen-Amherst—The Founder's Medal, for the encouragement of geographical science and discovery, was awarded to Lieut. A. L Palander, in recognition of the services rendered by him to geography as commander of the Vega in the late Swedish Arctic expedition, during which he safely navigated the ship along the unsurveyed shore of the Asiatic continent for nearly three thousand miles. The Patron's Medal was awarded to Mr. Ernest Giles for having led four great expeditions through the interior of Western Australia in the years 1872-6, during which six thousand miles of route were surveyed and twenty thousand square miles of new country discovered. A Gold Watch was awarded to Bishop Crowther, in recognition of the services he has rendered to geography during his numerous journeys in the region of the river Niger during the last forty years The annual Geographical Medals offered by the Society to the chief public schools were then presented to the following successful competitors —Physical Geography: Gold Medal, D. Bowie, of Dulwich College; Silver Medal, A L Humphries, of Liverpool College. Political Geography: Gold Medal, F. J. Naylor, of Dulwich College: Silver Medal, Theodore Brooks, of London International College. It was announced that the subject for the examination in 1881 both in physical and political geography would be Polynesia, including New Zealand.—The following gentlemen were elected as Council and Officers for 1880-81: President, Right Hon. Lord Aberdare; Vice-Presidents, Sir R. Alcock, Major-General Sir H C. Rawlinson, Sir H. Barkly, Sir B. H. Ellis, Capt. F. J O Evans, and F. Galton; Treasurer, R. T. Cocks; Trustees, Lord Houghton and Sir J. Lubbock, Bart.; Secretaries, C. R. Markham and R H. Major; Foreign Secretary, Lord Arthur Russell; Council, J. Ball, Sir T. F. Buxton, Bart., R. N. Cust, J. Fergusson, Sir T. D. Forsyth, D. W. Freshfield, Col. H. H. Godwin-Austen, J. K. Laughton, Lieut.-Gen. Sir J. H. Lefroy, Sir W. L. Merewether, Admiral Sir A. Milne, Bart., Capt. Sir G. S. Nares, Admiral Sir E. Ommanney, Col. Sir L. Pelly, Lord Reay, Major-General C. P. Rigby, Sir W. Silver, General R. Strachey, Sir R. Temple, Bart., Major-Gen. Sir H. L. Thuillier, and Sir H. C. Verney, Bart.

GEOLOGICAL SOCIETY.

May 26.—R. Etheridge, Esq., President in the chair.—Prof. F. Guthrie, Dr. R. Hænsler, Messrs. J. Hulme, W. Jolly, C. Myhill, and A. G. Savile, were elected Fellows.—The following communications were read: On "The Pre-Carboniferous Rocks of Charnwood Forest," Part III., conclusion, by the Rev. E. Hill and Prof. T. G. Bonney; on "The Geological Age of Central and West Cornwall," by Mr. J. H. Collins; and on "A Second Pre-Cambrian Group in the Malvern Hills," by Mr. C. Callaway.

SOCIETY OF ANTIQUARIES.

May 27.—E. Freshfield, Esq., V.P., in the chair.—Lieut.-Col. G. Francis exhibited two spearheads and a mediæval lock from Oystermouth Castle.—The Rev. G. S. Streatfeild exhibited some fragments of Roman pottery and other remains, which had been found recently at Worlaby, near Louth, in Lincolnshire. Mr. Streatfeild also exhibited a bronze leaf-shaped sword, which had been found on the same spot fourteen years ago.—Mr. Freshfield, by permission of the Rev. Dr. Ridding, head master of Winchester College, exhibited what appeared to be a *martel de fer*, recently found on the site of the old palace of Wolvesey in the course of some excavations undertaken for the purpose of converting the building to the purposes of the college. Of this very curious implement Mr. F. J. Baigent exhibited and presented (through Mr. Freshfield) five distinct views drawn by himself. Mr Baigent also communicated some remarks descriptive of the *martel de fer*, which were supplemented by a short paper on the same subject from Mr C K. Watson, who observed that the Wolvesey example differed from all those of which he had seen representations in the circumstance that while one end was pointed, like other examples, the other had the shape of a sort of cleft or bifurcate adze, which, so far as he could discover, was a unique type.—Capt. Dillon observed that the presence of the guard near the handle left no room for doubt that it was an implement of war. In this example, as in some others referred to by the secretary, there was a sort of hook near the head to attach it to the saddle bow.—Mr. C. K. Watson exhibited some armour which had been brought from the centre of Africa by Col. Gordon. It was fully described by Mr. J. Latham. It consisted (1) of two peaked German or Spanish morions of the seventeenth century, with Oriental mail attached to their quilted neck-pieces; (2) two shirts of body mail, probably Persian, and of the kind known as *grain d'orge*, rivetted together in the Persian fashion; (3) two armlets of a very common kind of steel, with ornamental work hammered into a crossed hatched surface, being "onlaid" as distinguished from "inlaid" work, and resembling the "Kuftgori" work of Northern India; these Mr. Latham believed to be Oriental, but Col. G. Weston expressed it as his opinion that they were native (African) imitations of Oriental work; (4) a steel shield, thirteen inches in diameter, gilt, with four raised bosses, and a crescent in relief, the rim covered with inscriptions in Persian characters; date, eighteenth century. The dome of the shield was covered with figures in relief of birds and animals surrounding arabesque panels, representing the Shah with female figures, cups, narghilies, and dishes. The chief interest of these objects might be described in Pope's lines to Arbuthnot:—

> "These things we know are neither rich nor
> rare,
> We wonder how the devil they got there."

As an illustration of a somewhat similar puzzle, Mr. Latham exhibited a Spanish morion of the sixteenth century, a coat of brass mail, and an indigenous wooden shield, which had come from Borneo.—Mr. A. W. Franks exhibited a curious gold signet ring of Phahaspes, King of Persepolis, *circa* B.C. 350, together with four other rings in illustration of it. In addition to his own remarks, Mr. Franks communicated some notes on the ring of Phahaspes by Mr. P. Gardner, of the British Museum, showing how the coins of Persepolis had enabled him to determine the attribution of the ring.—Mr. J. H. Parker communicated a paper on the early history of the city of Ardea.

June 3.—E. Freshfield, Esq., V.P., in the chair.—The Dean of Norwich and the Rev. J. Hodgson were admitted Fellows.—This being an evening appointed for the ballot, no papers were read. The following gentlemen were elected: Messrs. W. J. Cripps, L. Samson, F. Seebohm, and C. F. Keary. The Earl of Ashburnham was also proposed and elected under the provisions of the Statutes, ch. i. s. 6.

July 17.—H Reeve, Esq., V.P., in the chair.—Mrs. Branson exhibited and presented some ancient paintings on panel, in six pieces, which were discovered about 1813 by A. J. Kempe, at Baston House, Keston, Kent. Soon after their discovery they were drawn by Stothard, who said "they were the earliest specimens in oil" he had seen in this country. These drawings Mr. Kempe exhibited to the Society on March 4th, 1830, and on the 1st of April of the same year the panels themselves were shown. They are described and figured in the *Gentleman's Magazine* for December following At that time they belonged to S. N. Ward, of Baston House, from whom they descended successively to a son, the Rev. H. Ward, Rector of St. Peter's, Aldwinkle, and to a daughter, Mrs. E. Branson, who now presented them through her brother's executor, the Rev. Canon Jackson. These paintings appear to be the remains of a series of kings ranged along the wall of a large apartment One of the panels bears the name of Athelstan.—Major C. Cooper exhibited the remains of a British urn found at Toddington, and a small fragment of a brass—probably of the De Peyvre family—formerly in Toddington Church, of the time of Richard III.—The Rev A. Pownall exhibited a small bronze celt found at Naseby Wolleys.—Mr. V. E Knocker exhibited rubbings of two bells at Goring Church, Oxon. One of them was inscribed, "Sancte Blase;" the other, "Orate Pro Petro Exoniense Episcopo Ricard De Wambis Me Fist." It does not appear why Peter Quivil, or Wyville (consecrated November 10th, 1280), was commemorated at Goring. Richard Wambish, or Wimbish, was one of a well-known family of bell founders. In 1312 he cast a bell for the church of the Holy Trinity in Aldgate.—The Rev. J. M. Mello communicated an account of a small find of flint implements in a new locality, viz, in the North Frith woods, near Tunbridge.—Mr. J. F. Nicholls laid before the Society an account of the discovery of a large hoard of coins of the Lower Empire near Bristol, which had been discovered by a boy throwing a stone at a potsherd on the opposite side of a brook near Fillon. The pottery was smashed, and out came an avalanche of coins. The boy is believed to have collected upwards of three thousand pieces. Of those which Mr. Nicholls had seen none was earlier than Licinius or later than Constans I. Those of Constantine the Great were far more numerous.—Mr. R. C. Nichols read a paper on the correction of a numeral in a note to a manuscript of the Anglo-Saxon Chronicle (MS. Laud, 636), quoted by Dr. Oppert in his paper on "The Origin of the Dionysian Æra" (*Archæologia*, xliv., p. 347). Mr. Nichols showed that to make any sense of this passage we must read dxxxi. for xxx.—Mr. R. S. Ferguson communicated a report on the archæology of Cumberland and Westmoreland, and especially on some interesting discoveries of Roman remains at Maryport.—Mr. E. Peacock gave an account of Scotton Church and of its effigies, early glass, and other remains.—The Cumberland and Westmoreland Antiquarian Society presented a cast of what appeared to be a Runic inscription, recently found at Brough, Westmoreland.

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July 20th to August 20th inclusive.

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⁂ *The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.*

Utilisation of the Sun's Rays.—Some practical results appear to have arisen from the experiments of M. Mouchot in utilising solar heat. By means of a large collecting mirror, 12 ft. 6 in. in diameter, and capable of resisting the strongest gale, he has succeeded in raising over 60 pints of water to the boiling point in 80 minutes, and in 1½ hour more produced a steam pressure of eight atmospheres. During one day last March, in Algiers, a horizontal engine was driven at the rate of 120 turns per minute, under a pressure of 3½ atmospheres; and at another trial the apparatus worked a pump, raising at the rate of 264 gallons of water per hour one yard high. The pump was kept going from 8 a.m. to 4 p.m., and neither strong winds nor passing clouds sensibly interfered with its action. M. Mouchot can now readily produce a temperature sufficiently high to fuse various chemical substances, and which can also be used for concentrating syrups and other infusions.

Reviews.

"Journals and Journalism." London: Field and Tuer, Ye Leadenhalle Presse, E.C.

BOUND in the antique style by which other books emanating from this establishment have been characterised, this three-and-sixpenny manual is issued as a guide for literary beginners. Says the author in his preface:—Nearly all our great writers, whether journalists or not, began by contributing timorously and obscurely to the newspaper and periodical press, and that there are thousands of aspirants to-day eager to follow in their footsteps, and to take a place in the Republic of Letters, if they only knew how and where to make a start, is the conviction which has led to the compilation of this book. We feel that "John Oldcastle" has painted the journalistic world in colours far too rosy, and that the impression conveyed to the literary aspirant, after a careful perusal of the book, would be apt to tempt "anyone who can command a table, a chair, pen, ink, and paper to commence trade as a literary man" We would impress on the mind of the beginner a trite sentence which the author uses.—A journalist is bound to be a man of the world, as an author is bound to be a student. These qualifications are rare, but, co-existent with unflinching perseverance and constant industry, their possessor may reasonably hope to gain a high position in the Republic of Letters as he would in any other sphere of action to which he devoted such natural endowments. The general contents of the book embrace many valuable hints, and having at one time ourselves habitually received each week upwards of five hundred "contributions"—from the elaborated first chapter of a series to queries of most trivial import—we most heartily recommend all those who feel that their mission in life is the dissemination of heaven-born truths—in other words, to become journalists, and, indeed, all novices who are prompted to pen an article and send it unasked to an editor—to first purchase "Journals and Journalism," and then, if it must be written, at least to send in the contribution according to the tenets of "John Oldcastle."

"Elements of Chemistry—Theoretical and Practical." By WILLIAM ALLEN MILLER, M.D., D.C.L., LL.D. Revised and in great part re-written by HENRY E. ARMSTRONG, Ph.D., F.R.S., Sec Chem Soc., and CHARLES E. GROVES, F.C.S., Sec. Inst. Chem. Part III., Chemistry of Carbon Compounds or Organic Chemistry. Section 1: Hydro-carbons, Alcohols, Ethers, Aldehydes, and Paraffinoid Acids Fifth Edition. London: Longmans, Green, and Co. 1880.

THE science of chemistry strides along at such a pace that it is difficult to keep up with the almost daily discoveries which are being made; and in illustration of this fact we take the volume under consideration as an example. This volume comprises Section 1 of Part III. of Miller's "Elements of Chemistry," bearing on organic chemistry, and by way of exposition of its scope and contents we might observe that this one section is greater in bulk than the whole of the third part in the last edition. We can do no better, to show the various improvements made by the present editors, than quote their prefatory words:—

"A comparison of this edition with the previous one published in 1869 will render it evident that the present volume is practically a new treatise, more than four-fifths of the whole having been re-written The rapid development of that branch of physical science which comprises the carbon compounds rendered a change necessary in the system of classification employed by the late Professor Miller, and the adoption of one based on the analogy in chemical constitution and properties of compounds rather than on the source from which they happen to be obtained. At first an attempt was made simply to re-arrange and enlarge the work, so as to include the more important discoveries made since the issue of the last edition, but this had soon to be abandoned as impracticable. It therefore became necessary to re-write the treatise, incorporating those portions of the original available for the purpose."

The above quotation will show the extent of variations from the last edition, and we may add that this section of the work has been brought up to the present state of knowledge. We can only say that the intentions of the editors in our opinion have been carried out, and though there may be some omissions, yet the work as now presented gives us the latest discoveries and processes in the science of organic chemistry. To the advanced student this volume will be a welcome addition to his library The editors express a wish that their readers will point out any mistakes they may notice, and further, they will gladly welcome any suggestions or information. Communications on these points to be addressed to Dr Armstrong. We trust this invitation will be well responded to, in which case we shall, doubtless, judging from the completeness of the present work, hereafter be placed in possession of the most complete work on the subject that can possibly be obtained

"Elements of Astronomy." By ROBERT STAWELL BALL, LL.D., F.R.S., Royal Astronomer of Ireland. London Longmans, Green, and Co 1880

THIS volume forms another of the series of Text-books of Science, the merits of which series we have before had occasion to speak, and the one now before us will compare very favourably with those previously issued. The work, although mainly intended for beginners with some knowledge of mathematics, will be found of great service to advanced students and to others who delight in investigating the mysteries of the heavens

It would be difficult for us to quote from the volume, for to do anything like justice in this way would go beyond the space at our command, therefore we content ourselves by stating that to students it will be found of great service, further, we may remark that as the volume is not overcrowded with mathematical formulæ, it can be read with profit by those who take interest in the study of astronomy.

"Calvert's Catalogue of Books" Manchester: John Calvert, 99, Great Jackson-street.

THIS catalogue is a comprehensive list of books on technology and applied science, selected from the catalogues of all publishers, and forming an index of all works published relating to civil and mechanical engineering, building construction, trades, manufactures, and professions, the arts, and practical industrial science in general; each subject is relegated to its particular section, and it is thus easy to see at a glance the title and an epitomised summary of contents, together with the price of all works relating to any branch of industrial art The catalogue contains upwards of one hundred pages, and costs but sixpence We can cordially recommend it to all interested in self-educatin.

NEW BOOKS.

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WHAT IS CIVILISATION?

IN reviewing a book recently written by Dr. Arthur Mitchell, M.D., LL.D., the *Athenæum* says—

"In 1876 and 1878 Dr. Mitchell delivered two courses of Rhind Lectures on archæology, which he has now published under a somewhat clumsy double title, one half of which represents the main subject of each course. But the two series run together far more smoothly than their titles would seem to imply, and form, in fact, an organic whole. The thread which binds them together is the author's belief in a relatively fixed and constant human intelligence. It has been the habit of archæologists, and especially of prehistoric archæologists, of late years to accept that theory of human development which represents men as the descendants of a low primitive type, little gifted intellectually or emotionally. Dr Mitchell comes forward as the champion of an older and now less popular view, that man has always been much the same as we see him at present. From the very first, he argues, human beings seem to have been endowed with just the same faculties and potentialities as at the present day The earliest known human skulls, he asserts, are just as human, and apparently betoken just as much intelligence, as those of civilised men in our own time. The differences are not differences of type, they are merely differences of social organisation. A savage differs from an average European mainly in the fact that his society is less highly organised than that of France or England. Civilisation is a matter of social arrangement, of distribution of parts, not a matter of individual superiority. Culture is strictly personal, but civilisation is general: you cannot fairly say that a man is civilised, though you may say that he is cultivated, and you cannot fairly say that a community is cultivated, though a small proportion of its members may be so. These are the central ideas of Dr. Mitchell's work, and they are enforced with an amount of learning, original research, and acute reasoning which makes every page full of interest alike for the scientific anthropologist and the general reader. Dr. Mitchell is the able, cultivated, and fully equipped defender of what seems to be a losing cause.

It would be an injustice to his work, however, to represent it as dealing merely with such abstract questions in their naked form. On the contrary, the subject is treated with a great wealth of concrete illustration, and glows with colour from beginning to end The facts are first marshalled in array without a word of comment, and then the inferences to be drawn from them are unexpectedly set forth in a clear and often startling light. Dr. Mitchell's researches have led him to investigate the curious relics of the past which still linger so abundantly in the remote north and west of Scotland. There he finds a race of men, amongst the acutest in intellect of the Keltic and Scandinavian stocks, yet using implements in many cases as rude as the palæolithic age. In the Shetlands old women still employ the spindle and the whorl, exactly as their ancestors employed them four thousand years ago, the only difference being that modern whorls are far less ornate than their antique predecessors. Near Inverness a potato does duty instead of a stone or clay whorl. At Barvas, in the island of Lewis, the people manufacture home-made pottery without a wheel, as rude as the rudest ever discovered among the relics of the stone age or in use among modern savages. Yet the inhabitants of Barvas are not clothed in skins and eaters of raw flesh, 'in intellectual power and in their mode of living they are just what their neighbours are.' Manchester cottons, Staffordshire crockery, Sheffield cutlery, West Indian sugar, and Chinese tea may be found in the self-same cottages where these primitive jars and bowls are fashioned. Thus the very rudest arts may co-exist in a single community side by side with the most advanced. Similarly the 'Norse mills' of Shetland are the simplest and most ineffectual application of water power known amongst men; yet they answer the purpose of their makers well enough, because water power is abundant, and there is no need to economise it by such cunning inventions as overshot wheels. The bee-hive houses of the Hebrides form another example of a surviving archaic type, equally out of keeping at first sight with our existing civilisation. The rough bone buttons, the stone beds, the one stilted ploughs, the wheelless carts, dragged along upon their tilted beams, and the bismar or rude steelyard used in many parts of Scotland give rise to similar reflections. But the strangest instance of all is the all but modern stone implements found in Shetland. These consist of rough flint flakes, shaped by chipping, and quite recently used as knives or hatchets. So far as mere external appearance goes, they might be implements from the drift, were it not for the absence of that peculiar weathered appearance which is the distinguishing mark of genuine palæolithic specimens. The pre-glacial flints are discoloured for about a quarter of an inch from the surface, and display a banded outline when fractured. The Shetland implements, on the contrary, are apparently all but modern, and are found under circumstances which do not seem to imply any remarkable antiquity.

From all these examples, Dr. Mitchell draws the general conclusion that primitive man, or, at any rate, the man of the stone age, may have been really equal in intellectual powers to ourselves. Here in modern Scotland we find arts as rude as those of the palæolitic period side by side with an intelligence fully equal to the average of London or Manchester. May it not be, he suggests, that the race has progressed in organisation alone, not in actual capacities? Have we any evidence for a progress in ability as distinguished from mere results of increased co-operation? These subjects are treated in the second series of lectures, which deals with the question, What is civilisation? Dr. Mitchell believes that it consists in a sort of bond or compact to defeat the action of natural selection, and the degree of success attained in the struggle is the measure of the civilisation reached in each case. It is just as probable that savages are degraded forms of humanity as that the civilised man is an elevated form. Dr. Mitchell very ingeniously employs arguments derived from Mr. Wallace and Mr. Herbert Spencer to support these views, and he manages to do so with a delightfully *naive* and unconscious air, as though he fully expected Mr. Spencer to accept his conclusions. But indeed the whole book is a masterpiece of sceptical iron, wielded in the interests of doctrines exactly opposite to those which its premises have usually been held to prove. From this point of view its originality and literary skill are beyond all praise.

At the same time it cannot be allowed that Dr. Mitchell has by any means proved his case. It is not so easy for a single volume to overthrow the whole body of doctrine based upon the researches of Mr. Darwin, Sir John Lubbock, Mr. Tylor, and a thousand other independent investigators. Dr Mitchell does not even pretend to do so; he advances his doubts under the modest guise of suggestions or hints rather than in the form of deliberate and settled convictions. He inquires and hesitates where others assert, and by so doing he arouses honest doubts where mere assertion would have aroused nothing but opposition. Nevertheless, he often mistakes his ground. Like a great many other archæologists, he talks a little loosely about 'the stone age,' without usually distinguishing between the palæolithic and neolithic periods. In other words, he lumps together two epochs separated from one another by a vast interval of time, and having nothing in common except the mere accidental resemblance that in both stone was employed as a material for weapons. Misled by this vague expression, he goes on to make statements about the so-called primitive man which will hardly bear scientific investigation. We know that the skulls of the neolithic men, who were mere modern savages of yesterday, are not a whit inferior to the average skulls of any other savages, or, for the matter of that, to nine out of ten skulls that we see about us in Europe. But we know next to nothing about the skulls of the vastly earlier palæolithic men, and we cannot pronounce with certainty from such fragmentary evidence upon the question whether they were or were not a trifle more brute-like than our own. Moreover, it is admitted on all sides that the cave-men were essentially men, and men of a comparatively high type, quite as high as many existing savages, or even a little higher. There can be little doubt that they were intellectually superior to the Australians and the Fuegians, if they were not even equal to the Eskimo. Therefore it is quite certain that we cannot in any way regard them as a 'missing link,' or at least we must look upon them merely as the penultimate link in a long chain, whose other links are many and wanting. But it does not follow, because palæolithic man was relatively high in development, that 'primitive' man was so. Granting for a moment the general truth of Mr. Darwin's views, there is no reason why the quadrumanous stock which ultimately produced mankind may not have begun to differentiate itself from the remainder of the primates as early as the Pliocene, or the Miocene, or even the Eocene time. The fact that man was already essentially man in the drift period does not militate any more against his supposed development from a lower form than does the fact that he is essentially man in the nineteenth century. The creatures which produced the fire-split flints in the Miocene, discovered by the Abbé Bourgeois, may have been 'missing links;' or they may have been as decidedly men as the chippers of the Abbeville hatchets, but in any case the reasons for believing that man derives his origin from a lower type remain the same. We are not bound to accept any particular date for the evolution of humanity. Dr. Mitchell's suggestion seems on the whole beside the mark, they do not really touch the question at issue at all. At times, too, the author rather under-estimates the strength of the adverse evidence; for example, it can hardly be denied that many existing savages have capacities (as distinguished from realised powers) far below those of civilised men, and that while some savages seem capable of receiving civilisation, others seem hopelessly below it. Nevertheless, though Dr. Mitchell perhaps fails in making good his case, his book will be a useful caution against rash conclusions, and will cause many anthropologists seriously to reconsider not a few among their hasty generalisations. It comes as a wholesome disturbance to a somewhat dogmatic peace, and it is too honest and fearless to do anything but good to the science with which it deals. Perhaps we have all been too apt to acquiesce passively in the notion that the man of the early stone age was the primitive man, and that he was necessarily inferior in intelligence even to the lowest modern savages. Dr. Mitchell's book certainly casts the burden of proof upon the shoulders of those who assert such an inferiority rather than on the shoulders of those who reject it."

MANCHESTER SCIENTIFIC AND MECHANICAL SOCIETY.

THE members of the above society on Friday, the 6th ult., paid a visit to the Manchester, Sheffield, and Lincolnshire Railway Company's locomotive works at Gorton, near Manchester, which had been kindly thrown open to their inspection, and the splendid machinery contained in the establishment, which gives employment to about 3,000 mechanics and labourers, exclusive of locomotive drivers and the office departments—numbering about 500 additional *employés*—rendered the visit one of considerable interest. The members were first shown through the rolling mill department, where the Bessemer 3-ton plant and the patent re-heating furnace invented by Mr. Perkins, the manager of the works, were seen in operation. The Perkins furnace is probably pretty well known, but it may be stated that the object attained is the heating of the air before it enters the hearth. The hot air is made to come into contact with the combustible gases after leaving the fire-grate and in contact with the metal being heated, by which means an enormous saving of fuel is effected. The permanent way department was next visited, and here was seen the manufacture of spikes and fish-bolts and the fitting up of points and crossings. The party, having passed through the coppersmiths' shops, brass foundry and pattern shop, proceeded to the foundry, and here the rapidity with which railway chairs were being cast excited considerable astonishment, one man and a boy being able to cast 1,100 chairs per day. The branch of the works, however, which presented the most interest to the members was the heavy machinery department, and the various machines here employed, although probably possessing no very special features as compared with those to be seen in other large locomotive works, were yet of such a character as to deserve considerable attention. The slotting machinery in this department was particularly good, and one machine for cutting out the under framework for locomotives may be particularly noticed. This was what may be termed a heavy frame machine, with three heads, driven by friction gearing, and having three automatic transverses for the tools. By this machine no less than six frames, each one inch thick, and bolted together, are cut through simultaneously. There was also a quadruple boring machine for axle-boxes, eccentrics, sheaves, &c., by which one man and a boy are enabled to perform the work of three large lathes. Amongst the other machines were a number of excellent wheel-turning lathes and hydraulic lifts for removing the heavy locomotive wheels to and from the shop. Above this department was the fitting shop, and amongst the novelties seen here were bushes for outside rods, which are cast to size in chill, and are then ready for being placed in without any tool work whatever. These bushes are cast by this method in various sizes to meet the requirements of worn-out crank-pins, a supply being kept in stock for any necessities that may arise through breakdowns, and the unworked surfaces are considered to be better than those which have been tooled. The new erecting shops which were next visited were fitted up with all the modern improvements, the engine being lifted bodily from the rails by four powerful travelling cranes, one of which at the time of the visit was employed drawing the boiler out of a locomotive which had been sent in for repairs. In the smiths' shop wheels and other forgings were seen in construction, and the visitors were also shown a disused running shed which is being converted into a smiths' shop with twenty-four fires, a new locomotive running shed for 120 engines having just been erected. The boiler shop was next visited, and here a small portable machine for rhyming and screwing the holes of fire-boxes in position was seen in operation. This is a small machine held in the hands of the workman, and, by means of an adjustable band connected with the running shaft in the shop by which it is worked, is readily brought into operation at any point where it is required It had been intended to inspect also the carriage department, but so much time had been occupied with the locomotive portion of the works that it was decided to postpone any further inspection until a future visit.

SHELL-LAC CULTIVATION.

Our supplies of shell-lac, or, as it is more commonly written, shellac, are derived almost exclusively from India, where its collection and preparation give employment to a considerable number of natives. It is the product of an insect, deposited on the twigs of trees, partly as a defence for the eggs over which it is incrusted, and partly as a food for the young larvæ. These twigs are collected, and generally, for convenience of transport, brought to market cut up in lengths of two or three inches, called "stick-lac." They then undergo various processes, the objects of which are, first, to separate the resinous incrustation from the wood; secondly, to free this resin from the colouring matter which it contains, thirdly, to convert the resin into what is known as "shellac;" and, fourthly, to form the colouring matter into cakes of dye known as "lac-dye." In the course of manufacture it is known by various names: When the lac is separated from the wood it is called "seed-lac;" this, melted and formed into cakes, becomes "lump-lac;" and, when again melted and transformed by a curious process into thin, brittle sheets or flakes, takes the form and name by which it is generally known of shell-lac. To "seed-lac" an interest has lately been imparted, not anticipated when the first was employed, the seed-lac being used actually as seed for the cultivation of lac in districts where it is not indigenous The officers of the Forest Department of India according to the *Colonies and India* have discovered that by judiciously applying the seed-lac to suitable trees the insect can be made to take up its home in new localities. This transplanting of the insect can also be effected by bodily transplanting the trees on which the eggs and lac are deposited, or by removing the twigs with their lac covering to the place selected for the cultivation of the product. In this way the lac industry is being spread over many new parts of India; and it is found that great economy in the cost of collection is achieved, since the material can be produced in large quantities in a comparatively small district, instead of being searched for over large forest areas as at present. The value of lac annually exported from India, which a few years ago was barely £200,000, is now nearly three-quarters of a million sterling

Correspondence.

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EXPLOSIONS IN COAL MINES.

TO THE EDITOR OF THE SCIENTIFIC AND LITERARY REVIEW.

Sir,—Your correspondent "H. B." opens up for discussion an important subject with which is involved not only an immense capital, but the lives of thousands. Mr. William Young, who has given much time to the study of the causes which produce the disastrous explosions in collieries, publishes a small pamphlet on the subject, which may be had from Messrs. Archer and Sons, the publishers, Wellington-place, Belfast, and a perusal of which would probably interest "H. B."—I am, &c.,

C. G. F.

Churning by Goat Power.—The most striking feature of the dairy ranch of F. S. Clough, in San Mateo canyon, is the new dairy house which Mr. Clough recently completed at a cost of 1,500 dols. It is 18 ft by 36 ft in ground dimensions, finished externally in rustic style, and inside is as trim as the thrifty housewife's "best room" The butter room, an apartment 10 ft by 15 ft in dimensions, is carpeted (!) and as inviting as a parlour. The apparatus for handling the milk and making the butter is complete in every detail, and is designed throughout for the saving of labour. A receiving vessel, fitted with a strainer, is located in the milking yard, and communicates by a pipe with the dairy house. The milkers pour their milk into this receiver and that is the end of their duties. The milk passes down through the pipe to a 200 gallon tank in the dairy house, whence it is drawn by the dairymen, undergoing, meanwhile, a second straining process. It is then placed in pans to cool and raise the cream. Water is brought in pipes through the house from a mountain spring The churn holds 52 gallons of cream and turns out from 100 lb. to 120 lb. of butter at each churning. It is worked by goat power, the appliances being a treading wheel 18 ft. in diameter, which connects with and operates a shaft running into the dairy house, and this in turn connecting with cog wheels working the dashers. Mr. Gow says that the goats in operating the wheel, indulge in their natural propensity for climbing, and they apply themselves to the work with great gusto. The herd consists of some eight or ten animals, ranging from the grandmother and old Billy with the whiskers, down to the youngling not over a foot high. When released from their pen they one and all, great and small, run bleating for the wheel, and the only trouble to contend with thereafter is the excess of power which they are apt to give it in the course of their frolicsome gambols.—*Los Angelos* (Cal.) *Express.*

Acetic Acid from New Zealand.—A new industry has been started at Christchurch, New Zealand, the distillation of acetic acid, thereby utilising the timber cleared. One cord of wood will produce 36 gallons of crude acid, worth in England about 1s. 6d. per gallon.

Celluloid for Stereotyping.—A new process for obtaining stereotypes for printing has been discovered by M. Emile Jannin, a sculptor of Paris, who proposes to employ celluloid for that purpose. The process of preparation takes only half an hour when the types are once set up, and the plates produced are suitable for working on cylinder machines running at a high speed, being very light, flexible, and durable. In this last respect they surpass metal plates, affording, it is said, 50,000 impressions.

A New Screw.—It is a well-known fact that the great bulk of the screws used in the commonest kinds of joinery are driven in with the hammer, and given a turn or two with a screwdriver to bring them flush. An ingenious inventor, for many years somewhat prominently identified with the business, has brought out a new screw, which is adapted for driving, and which enters the wood without tearing the grain. The gimlet point is dispensed with, and a cone point substituted. The thread has such a pitch that it drives in barb fashion, offering no resistance in entering, but firmly resisting all attempts to withdraw it except by turning it out with the screwdriver. The head is flat, but in setting it up two nipples or square-shouldered projections are raised in it by the one operation. The screwdriver takes hold of them more easily than it does of the customary nick, and holds quite as firmly, and when driven flush the projections on the head are not in the way, and do not disfigure it. It is claimed that this screw can be made one-third cheaper than ordinary screws, the principal saving being effected in doing away with the necessity of sawing the nick in the head.

Pearls in New Zealand.—While passing along the banks of Oakley Creek, an old resident of the district observed a peculiar and, to him, new shell-fish in the sand. A little search disclosed a large number of them of various sizes. The inner coating of the shell was found to be mother-of-pearl of fine quality, and in several of the larger shells he found loose pearls. The pearls are described as unusual in form and colour, not perfectly round, but far more brilliant than ordinary pearls.

Pneumatic and Telegraphic Messages.—Mr. Fawcett stated before the House of Commons that the number of pneumatic messages sent in Paris in the course of a month was 40,000, or 480,000 a year. He had further to state that there seemed to be the greatest variety of opinion as to the relative advantages, both financial and otherwise, in the conveying of messages in large cities by means of pneumatic tubes and telegraph wires. He would take steps during the recess to cause an impartial inquiry to be made into the whole subject, with the assistance of one or two competent officials from the Post Office. We understand that the circular system of pneumatic telegraphs, hitherto used in Paris, is gradually being superseded by that known as the radial one.

Detection of Salicylic Acid.—The following method of detecting small quantities of salicylic acid in wines and such-like coloured fluids has been suggested by Dr. Weigert, and is equally applicable to the detection of acid in beer. Fifty cub. cent. (about 1¾ oz.) of the wine or beer is shaken up for some minutes in a flask with 5 cub. cent. of amylic alcohol, which dissolves all the salicylic acid; the supernatant liquid can be poured off into a test-glass, and it is then mixed with an equal volume of alcohol, in which it dissolves, to this solution are added a few drops of dilute solution of ferric chloride; if any salicylic acid be present the usual well-known deep violet colour will at once be produced It is said that a very small quantity of salicylic acid can be detected in this way.

The Scientific Review

AND

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THE SESSION 1879—1880

IS ENDED.

The Balance Sheet 1879-80 can now be inspected.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

Proceedings of the Institute.

The Institute being out of Session, there is no business to report.

Monthly Notices.

Diffusion of the Electric Light.—M. L. Cémandot suggests the use of spun glass as an effective method of procuring the diffusion of the electric light. He uses a lamp with double glass walls, between which is placed the spun glass.

Memoir on Galvanism.—The Aldini Gold Medal (worth £40) will be awarded by the Academy of Sciences of the Institute of Bologna to the best memoir on galvanism (animal electricity). Memoirs to be written in Italian, Latin, or French, and sent in before June 30, 1882.

A Novelty in Fire Alarms and warning thermometers has been produced by our esteemed friend, Mr. G. E. Pritchett, F.S.A., architect, of Spring-gardens, S.W. It is a very ingenious instrument, whereby the action of air and mercury is utilised in a closed tube or holder of peculiar form, securing unerring action upon an electric bell or alarm sounder. We hope shortly to present our readers with full details as to this very scientific, ingenious, and important invention.

Composite Diamonds.—A *soi-disant* diamond expert of Chicago asserts that many of the so-called solitaires, sold as single stones, are made up of small stones cleverly put together. Under the blowpipe they separate. He adds that not one diamond in ten sold in the United States is other than the refuse of the London market. Nearly all are off-coloured, specked, or feathered, and are sold at a fictitious value. We give Americans credit for being too "cute" to allow such transparent frauds to be practised on them.

A Magneto-Electric Stone-Breaker.—This machine is one of the latest American inventions. A dynamo-electric machine furnishes the power to an electro-magnetic chopper capable of delivering from 1,000 to 2,000 blows per minute. Stone-breaking requires the exertion of very great forces through very small distances, in fact, precisely the kind of work for which electro-magnetic machines on a large scale might be expected to be successful. The cost of generating the electricity is, however, a drawback.

Another Electric Motor.—M. Marcel Deprez, the ingenious inventor of many pieces of electrical apparatus, has just brought out an electric motor, in which a piston of soft iron is attracted up and down in a hollow cylindrical electro-magnetic coil with a motion like that of an ordinary steam engine piston. This principle is not new, having been employed by Page, Bourbouse, and and Du Moncel in the construction of electro-motors. The novel point, however, about the motor of M. Deprez is that the magnetism of the soft iron core is neither ever reversed or interrupted. This was the weak point of the earlier machines, but it has been obviated in the new form by the device of dividing the solenoidal coil into sections like the separate coils of the ring-armature of the Gramme machine, the current being thus transmitted first to one part of the cylindrical coil and then to another, The commutator which distributes the current successively to the various sections is worked by an eccentric on the shaft of the fly-wheel in the ordinary way.

Phosphorescence of the Glowworm.—In some experimental researches, the results of which have lately been published in the *Comptes Rendus* of the French Academy, M. Jousset de Bellesme draws the following conclusions:—It is very probable that the phosphorescent substance is a gaseous product, for the structure of the gland, well studied by Owsjanikof, does not give one the idea of an organ secreting liquid. But chemical phosphorescent products at an ordinary temperature are not numerous, which induces one to believe the substance is phosphuretted hydrogen. It is for chemists to elucidate this point; but they should seek the matter in the cellular protoplasm and not directly. My researches induce me to believe phosphorescence a property of protoplasm, consisting in the disengagement of phosphuretted hydrogen. This explains why many of the lower animals, deprived of a nervous system, are phosphorescent. Besides, it offers the advantage of connecting the phenomena of phosphorescence in living beings with that we see in organic matters in a state of decomposition. It is one more example of a phenomenon of the biological order traced to an exclusively chemical cause.

Denis Papin, born in 1647, a reputed inventor of the first steam vessel, and whose name is associated with Papin's Digester, has been honoured by a statue in his native town, Blois, which was unveiled on Sunday, the 29th of August.

Messrs. Cassell, Petter, and Galpin announce for the coming season new instalments of their popular serials. The fourth volume of the "New Natural History," edited by Professor Martin Duncan, which contains 'Birds,' by Mr. R. Bowdler Sharpe, F.L.S., 'Reptiles' and 'Amphibians,' by Prof. Martin Duncan; the yearly volume of "Science for All" for 1880, edited by Dr. Robert Brown; Vols. IV and V. of "The Countries of the World," by Dr. R. Brown; "Great Industries of Great Britain," complete in three volumes; Vol. II. of "Our Own Country;" and "Insect Variety: its Propagation and Distribution," by Mr. A. H. Swinton, member of the Entomological Society.

A Natural Gas Well near Boston.—A notable discovery is reported from Ocean Spray, a new summer resort near Boston, Mass., U S. While a driven well was being sunk, July 22, a vein of natural gas, which burns with a clear brilliant light, was struck at the depth of 122 feet. Being so near the house of Deacon Augustus Reed as to endanger its safety, the blaze was smothered and the well abandoned. The adjoining lot was owned by Mr. J. H. Jessop, who, thinking the gas worth boring for, had another well driven. Gas was struck July 30, and since then the flow has been abundant and strong. Mr. B. R. Sturges, of South Boston, writes us that the pressure of the gas was measured August 5 by the State Gas Inspector, and found to be that of 31¾ inches of water. Photometric tests made by the Superintendent of the East Boston Gas Works showed the gas to be of 14 candle power, giving a pure and brilliant light with various styles of burners. An attempt will be made to utilise the gas for illumination, cooking, and heating.—*Scientific American.*

Mr. Baden Powell's paper, before the Economic Science Section of the British Association, "On the Results of Protection in the United States,' was most warmly received. It asserted the existence of four principal obstacles to the adoption of a more liberal policy: (1) the present cheapness of land; (2) the influx of foreign capital into the States; (3) government by manhood suffrage; and (4) vested interests, the last appearing to him very difficult to overcome, except with the increase of population. The lively discussion which followed included the expression of Sir ANTONIO BRADY's surprise that the astute Yankee should consent to pay a tax of 30 to 50 per cent. upon many articles simply to benefit 5,000 manufacturers; Capt. Bedford Pim's explanation that to him protection meant empire, and free trade Utopia; and Mr. STEPHEN BOURNE's answer that it was the agitators in this country for a return to protection who retarded the adoption of free trade by other countries Mr. Hastings, in summing up, said those who want a protective duty on our imports to increase our prosperity were like a man who with a falling income went to his butcher and baker and asked them to charge him more for meat and bread. In his address as president of this section, Mr Hastings, M.P., contended bravely for statistics, notwithstanding evil use, as being the true foundation of legislation, while no legislation by which the productiveness of the land, the foundation of national wealth, was promoted could be opposed to political economy. Even the Compensation for Disturbance Bill was founded on a principle that had been law ever since the days of the Roman emperors in other countries of Europe.—*Athenæum.*

Researches on Ozone.—At very elevated temperatures the transformation of oxygen into ozone and of ozone into oxygen probably obey the laws of the decomposition of homogeneous systems. At mean temperatures the decomposition of ozone is considered always complete, slowly at common temperatures, but quickly at 250°. The instability of this body is therefore comparable to that of hypochlorous acid or nitrogen chloride. But whilst the heat necessary to constitute these explosive bodies can only be acquired by a secondary simultaneous reaction, the allotropic transformation of oxygen may be determined by the electric effluve alone. The act of electrisation places momentarily oxygen in conditions analogous to those of bodies which possess the property of combining directly, or of becoming polymerised under the action of heat.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

THE jubilee of the British Association for the Advancement of Science was opened on the 21st ult. in the flourishing seaport of Swansea; and the President for the year, Professor Ramsay, Director-General of the Geological Survey of the United Kingdom, delivered the opening address. That address will be read with intense interest, not only by men of science but also by the general public, who have of late, thanks to the British Association and similar scientific bodies, taken a lively interest in subjects, the study of which had hitherto been confined to the few The British Association has now completed the fiftieth year of its existence, and what might be called its golden wedding has been celebrated in its visit to South Wales. Half a century ago the first meeting of the Association was held in the city of York, where the opening meeting of the second half century of its existence will be appropriately held next year. For a long time after its birth the Association was looked upon in many lights. Its objects were applauded by men of learning, whilst it was sneered at by many, and ridiculed by the multitude generally. To-day it is a power in the world of thought, and is enjoying a stoutly fought-for and undying reputation. The most important cities and towns in the kingdom compete yearly for its presence. To many who have not studied it, the study of science may appear dry and disagreeable; but those who have mastered it in any or many of its branches know the wealth of enjoyment it affords. Even, however, from an outsider's view, there are many enjoyments in connection with the visits of the British Association to various parts of the country. These visits take place during the most delightful season of the year, and those that fix upon the towns to be visited almost invariably cast their lots in pleasant places. As well as the papers to be read in the various sections, there are excursions, which not unfrequently partake of the character of a pic-nic, to the most interesting spots in the neighbourhood. The houses of the county magnates are thrown open to the approach of the members of the Association, so that altogether their labours are by no means unmixed with pleasure. This year the bold and beautiful scenery of South Wales had to be inspected; and it is to be hoped that its inspection brought with it improvement in health as well as addition to scientific knowledge.

The meeting was opened in the Music Hall, Cradock-street, Swansea, by the formal resignation of his presidentship of Dr. Allman and the inauguration of his successor, Professor Ramsay. Among the other gentlemen on the platform were Mr. Pengelloy, Mr. J. Heywood, Mr. J. Glaisher, Professor J. H. Gladstone, Captain Douglas Galton, Dr. Sorby (President of the Geographical Society), Professor Abel, Dr. Sclater, Dr. Gilbert, Admiral Sir E. Ommanney, Mr. J. G. Jeffreys, the Abbé Renard, Mr. Balfour, Professor Williamson, Mr. Hussey Vivian, M.P., Mr. Dillwyn, M.P., the Mayor of Swansea, Professor Adams, Dr. Günther, General Sir John Henry Lefroy, and Mr. G. W. Hastings, M.P.

Mr. J. Jenkins, the Mayor of Swansea, in welcoming the British Association, said that since its former visit, thirty-two years ago, every year had added to its progress, its usefulness, and the marvellous impulse it had given to every branch of science. Thirty-two years ago Swansea was a marine resort of great natural beauty; now it was a centre of manufacturing life, in which science was applied with a grim reality. Ingenious Bible critics contended that this was the ancient Tarshish, the tin-producing country of those times. Whatever it was then, it certainly was now the tin manufactory of the whole world, and it could not be the fault of the men of South Wales if the wise men of the East, their brethren of the setting sun, and mankind in general, did not continue to obtain from this part of the United Kingdom their supplies of tin. They did not pretend to introduce to this learned society anything new in science, but they rather hoped to obtain hints and information which would be of advantage in the future to the manufacturers of the district.

Dr. Allman then took the chair, and after an eulogium upon the geographical researches and knowledge of his successor, transferred the presidentship to Dr. Andrew C. Ramsay, F R.S., Director-General of the Geographical Society of the United Kingdom.

Prof. Ramsay's address was "On the Recurrence of Certain Phenomena in Geological Time." He said in this address I propose to consider the recurrence of the same kind of incidents throughout all geological time, as exhibited in the various formations and groups of formations that now form the known parts of the external crust of the earth. In older times, Hutton and Playfair, in a broad and general manner, clearly pointed out the way to the doctrine of uniformity of action and results, throughout all known geological epochs down to the present day; but after a time they obtained but slight attention, and were almost forgotten, and the wilder cosmical theories of Werner more generally ruled the opinions of the geologists of the time. Later still, Lyell followed in the steps of Playfair, with all the advantages that the discoveries of William Smith afforded, and aided by the labours of that band of distinguished geologists, Sedgwick, Buckland, Mantell, De la Beche, Murchison, and others, all of whom some of us knew. Notwithstanding this new light, even now there still lingers the relics of the belief that the physical phenomena which produced the older strata were not only different in kind, but also in degree from those which now rule the external world. Oceans, the waters of which attained a high temperature, attended the formation of the *primitive* crystalline rocks. Volcanic eruptions, with which those of modern times are comparatively insignificant, the sudden upheaval of great mountain chains, the far more rapid decomposition and degradation of rocks, and, as a consequence, the more rapid deposition of strata formed from their waste—all these were assumed as certainties, and still linger in some parts of the world among living geologists of deservedly high reputation. The chief object of this address is, therefore, to attempt to show, that whatever may have been the state of the world long before geological history began, as now written in the rocks, all known formations are comparatively so recent in geological time, that there is no reason to believe that they were produced under physical circumstances differing either in kind or degree from those with which we are now more or less familiar. It is unnecessary for my present purpose to enter into details connected with the recurrence of marine formations, since all geologists know that the greater part of the stratified rocks were deposited in the sea, as proved by the molluscs and other fossils which they contain, and the order of their deposition and the occasional stratigraphical breaks in succession are also familiar subjects What I have partly to deal with now, are exceptions to true marine stratified formations, and after some other important questions have been considered, I shall proceed to discuss the origin of various non-marine deposits from nearly the earliest known time down to what by comparison may almost be termed the present day. The instances of the metamorphism of stratified rocks in the British Isles, throughout Europe, and on the American continent, the President went on to state, proved that from the Laurentian epoch onward the phenomenon of extreme metamorphism of strata has been of frequent recurrence all through Palæozoic and Mesozoic times, and extends even to a part of the Eocene series equivalent to the soft unaltered strata of the formations of the London and Paris basins, which, excepting for their fossil contents and sometimes highly inclined positions, look as if they had only been recently deposited. The oldest volcanic products of which he had personal knowledge were of Lower Silurian age. He knew of no true volcanic rocks in the Upper Silurian series. In the old Red Sandstone of Scotland lavas and volcanic ashes are of frequent occurrence, interstratified with the ordinary lacustrine sedimentary strata Volcanic rocks are also intercalated among the Devonian strata of Devonshire He knew of none in America or on the Continent of Europe. In Scotland volcanic products are common throughout nearly the whole of the Carboniferous subformations, and they are found also associated with Permian strata. In the Mesozoic or Secondary epochs, of Jurassic age (Lias and Oolites), it was stated by Lyell, with some doubt, that true volcanic products occur in the Morea and also in the Apennines, and it seemed probable that the Rajmahal traps may also be of Jurassic age Darwin stated that the Cordillera, of South America, had been, probably with some quiescent periods a source of volcanic matter from an epoch anterior to our Cretaceo-oolitic formation of the present day. In the Deccan volcanic traps rest on Cretaceous beds, and are overlaid by Nummulitic strata, and according to Medlicott and Blanford there were poured out in the interval between Middle Cretaceous and Lower Eocene times. In Europe the only instance of a volcano of Eocene age was that of Monte Bolca, near Verona, where the volcanic products are associated with the fissile limestone of that area. The well-preserved relics of Miocene volcanoes are prevalent over many parts of Europe, such as Auvergne and the Velay, where the volcanic action began in Lower Miocene times, and was continued into the Pliocene epoch. The volcanoes of the Eifel are also of the same general age, together with the ancient Miocene volcanoes of Hungary The volcanic rocks of the Azores Canaries, and Madeira are of Miocene age, while in Tuscany there are extinct volcanoes that began in late Miocene, and lasted into times contemporaneous with the English Coralline Crag. In the north of Spain also, at Olot, in Catalonia, there are perfect craters and cones remaining of volcanoes that began to act in newer Pliocene times, and continued in action to a later geological date To these he must add the great *coulées* of Miocene lava so well known in the Inner Hebrides, on the mainland near Oban, &c, in Antrim in the North of Ireland, in the Faroe Islands, Greenland, and the Franz-Joseph Land. In nearly all geological ages volcanoes have played an important part, now in one region, now in another, from very early Palæozoic times down to the present day, and, as far as his knowledge extended, at no period of geological history was there any sign of their having played a more important part than they do in the epoch in which we live. The mountain chains of the world are of different geological ages, some of them of great antiquity and some of them comparatively modern In North America the Laurentian rocks formed a high mountain-chain of pre-Silurian date, which has since constantly been worn away and degraded in sub-aerial denudation. In Shropshire and in parts of North Wales, and in Cumberland and Westmoreland, the Lower Silurian rocks by upheaval formed hilly land before the beginning of the Upper Silurian epoch, and both here and in Scotland the rocks have since undergone considerable movements, which in the main seem to have been movements of elevation, accompanied undoubtedly by that constant atmospheric degradation to which all high land is especially subject. In North America the great chain of the Alleghany Mountains underwent several disturbances, the last (a great one) having taken place after the deposition of the Carboniferous rocks, and before that of the new Red Sandstone In South America the main great disturbance of the strata that form the chain of the Andes took place apparently in post-Cretaceous times. The Alps, the rudiments of which began in more ancient times, received their greatest disturbance and upheaval in post-Eocene days, and were again raised at least 5,000 feet at the close of the Miocene epoch. In the north of India the history of the Great Himalayan range closely coincided with that of the Alps. It would probably not be difficult by help of extra research to add other cases to this notice of recurrence of the upheaval and origin of special mountain chains; but enough had been given to show the bearing of this question on the argument of repetition of the same kind of events throughout all known geological time. The next point was the recurrence of the development of beds of various salts (chiefly common rock salt) in many formations. The earliest deposits of rock-salt that he knew about are in the Punjaub The beds of salt are of great thickness, and along with gypsum and dolomitic layers occur in marl of a red colour like our Keuper marl. The Salina or Onondaga Salt Group of North America, which forms part of the Upper Silurian rocks, and lies immediately above the Niagara Limestone, is rich in gypsum and in salt brine, often of a very concentrated character, "which can only be derived from original depositions of salt," and it is supposed to contain solid rock-salt 115 feet in thickness at the depth of 2,085 feet, near Saginaw Bay in Michigan. In Michigan salts are found from the Carboniferous down to the Devonian series; and in other parts of the United States, from the lower coal-measures salts are derived which must have been deposited in inland areas, since even in the depths of inland seas that communicate with the great ocean, such as the Mediterranean and the Red Sea, no great beds of salt can be deposited. Before such strata of salt can be formed supersaturation must have taken place. In the North of England, at and near Middlesbrough, two deep bore holes were made some years ago in the hope of reaching the coal-measures of the Durham coal-field. One of them, at Salthome, was sunk to a depth of 1,355 feet. First they passed through 74 feet of superficial clay and gravel, next through about 1,175 feet of red sandstones and marls, with beds of rock-salt and gypsum The whole of these strata (excepting the clay and gravel) evidently belong to the Keuper marls and sandstones of the upper part of our New Red series. Beneath these they passed through 67 feet of dolomitic limestone, which in this neighbourhood forms the upper part of the Permian series, and beneath the limestone the strata consist of 27 feet of gypsum and rock salt and marls, one of the beds of rock salt having a thickness of 14 feet. This bed of Permian salt is of some importance, since he had been convinced for long that the British Permian strata were deposited, not in the sea, but in salt lakes comparable in some respects to the Great Salt Lake of Utah, and in its restricted fauna to the far greater salt lake of the Caspian Sea The gypsum, the dolomite or magnesian limestone, the red marls covered with rain pittings, the sun cracks, and the impressions of footprints of reptiles made in the soft sandy marls when the water was temporarily lowered by the solar evaporation of successive summers, all point to the fact that our Permian strata were not deposited in the sea, but in a salt lake or lakes once for a time connected with the sea. In the Permian strata of Russia he believed that the red marls, grits, sandstones, conglomerates, and great masses of gypsum and rock-salt were all formed in a flat inland area which was occasionally liable to be invaded by the sea during intermittent intervals of minor depression, sometimes in one area, sometimes in another, and the fauna small in size and poor in numbers is one of the results, while the deposition of beds of salt and gypsum is another. If so, then in the area now called Russia, in sheets of inland Permian water, deposits were formed strictly analogous to those of Central Europe and of Britain, but on a larger scale. In the Triassic series salt is found in the Bunter sandstones of Schoningen in Brunswick, and also near Hanover. In the lower part of the Keuper series deposits of rock-salt are common in England and Ireland. In the Jurassic series (Lias and Oolites) salt and gypsum are not uncommon. In the Cretaceous rocks salt occurs at Jebel Usdom by the Dead Sea, and other authorities state that it occurs in the Pyrenees and at Biskra in Africa, where "mountains of salt" are mentioned as of Cretaceous age. In the Eocene or Older Tertiary formations rock-salt is found at Cardona in Spain, and at Kohat in the Punjab it occurs at the base of Nummulitic beds. The record does not end here, for a zone of rock-salt lies in Sicily in Lower Miocene beds, and in Miocene strata gypsum is found at several places in Spain. In Pliocene or Later Tertiary formations thick beds of gypsum are known in Zante, and strata of salt occur in Roumania and Galicia, while in Pliocene rocks, or in post-Tertiary beds, a thick bed of pure salt was penetrated to a depth of 38 feet at Petit Anse in Louisiana. Rock salt, and other salts, are thus of frequent recurrence throughout all geological time, and as it is impossible that common salt can be deposited in the open ocean, it follows that this and other salts must have been precipitated from solutions, which, by the effect of solar evaporation, became at length supersaturated, like those of the Dead Sea, and the great salt lake of Utah. He now came to the subject of recurrences of fresh water conditions both in lakes and estuaries In the introduction to the "Geology of India," by Messrs Medlicott and Blanford, mention is made of the Blaini and Krol rocks as probably occupying "hollows formed by denudation in the old Gneissic rocks," and the inference is drawn that, "if this be a correct view, it is probable that the cis-Himalayan Paleozoic rocks are in great part of fresh-water origin, and that the present crystalline axis of the Western Himalayas approximately coincides with the shore of the ancient palaeozoic continent, of which the Indian Peninsula formed a portion." The Krol rocks are classed broadly with "Permian and carboniferous" deposits, but the Blaini beds were undoubtedly considered to belong to Upper Silurian strata. If this point should be established this is the earliest known occurrence of fresh-water strata in any of the more ancient paleozoic formations. The colour of the strata formed in old lakes, whether fresh or salt, of palæozoic and mesozoic age is apt to be red, a circumstance due to the fact that each little grain of sand or mud is usually coated with a very thin pellicle of peroxide of iron. Whether or not the red and purple Cambrian rocks may not be partly of fresh-water origin is a question that no one but himself had raised. There is, however, no doubt with regard to the fresh-water origin of the Old Red Sandstone as distinct from the contemporaneous marine deposits of the Devonian strata, the absence of marine shells and the nature of the fossil fishes in these strata showing that they were deposited not in the sea, as had always been asserted, but in a great fresh-water lake or in a series of lakes. The Devonian rocks of Russia are exclusively of a marine character. The lowest members of the series consist of flag-like compact limestones accumulated in a tranquil sea and containing fucoids and encrinites, together with shells of Devonian age, while the upper division graduates into the Carboniferous series as it often does in Britain, and, like the Old Red Sandstone of Scotland, contains only fish remains, and in both countries they are of the same species. Fresh-water formations are also found deposited in estuaries and lakes from the close of the Old Red Sandstone times down to late Tertiary epochs. In fact, it may be safely inferred that something far more than the rudiments of our present continents existed long before Miocene times, and thus accounts for the large areas on those continents which are frequently occupied by Miocene fresh water strata. The last special subject for discussion was the Recurrence of Glacial Epochs, a subject which was generally looked upon as an absurd crotchet when, in 1855, he first described to the Geological Society boulder-beds containing ice-scratched stones, and erratic blocks in the Permian strata of England In July he received information from Prof Geikie that he had discovered mammilated *moutonnée* surfaces of Laurentian rocks, passing underneath the Cambrian Sandstones of the north west of Scotland at intervals, all the way from Cape Wrath to Loch Torridon, for a distance of about 90 miles The next sign of ice in Britain is found in the Lower Silurian rocks of Wigtonshire and Ayrshire In the Himalayas of Pangi, S E. of Kashmir "old slates, supposed to be Silurian, contain boulders in great numbers," which Medlicott and Blanford believe to be of glacial origin He knew of no boulder formations in the Carboniferous series, but they are well known as occurring on a large scale in the Permian. brecciated conglomerates, where they consist "of pebbles and large blocks of stone, generally angular, imbedded in a marly paste. . . . The fragments have mostly travelled from a distance, apparently from the borders of Wales, and some of them are three feet in diameter" He knew of no certain evidence of glacial phenomena in Eocene strata, nor of any Miocene glacial deposits excepting those in the north of Italy, near Turin These contain many large erratic boulders derived from the distant Alps, which were then at least as lofty or even higher than they are now. At a still later date there took place in the north of Europe and America what is usually misnamed "the Glacial Epoch," when a vast glacial mass covered all Scandinavia, and distributed its boulders across the north of Germany, as far south as the country around Leipzig, when Ireland also was shrouded in glacier ice, and when a great glacier covered the larger part of Britain, and stretched southward, perhaps nearly as far as the Thames on the one side, and certainly covered the whole of Anglesey, and probably the whole, or nearly the whole, of South Wales This was after the advent of man Lastly, there is still a minor Glacial Epoch in progress on the large and almost unknown Antarctic continent, from the high land of which, in latitudes which partly lie as far north as 60 deg and 62 deg, a vast sheet of glacier ice of great thickness extends far out to sea and sends fleets of icebergs to the north, there to melt in warmer latitudes. If in accordance with the theory of Mr. Croll, founded on astronomical data, a similar climate were transferred to the northern hemisphere, the whole of Scandinavia and the Baltic would apparently be covered with glacier-ice, and the same would probably be the case with the Faroe Islands and great part of Siberia, while even the mountain tracts of Britain might again maintain their minor system of glaciers. In opening this address, he began with the subject of the oldest Metamorphic rocks that he had seen—the Laurentian strata. It was evident to every person who thinks on the subject that their deposition took place far from the beginning of recognised geological time. For there must have been older rocks by the degradation of which they were formed. And if, as some American geologists affirm, there are on that continent Metamorphic rocks of more ancient dates than the Laurentian strata, there must have been rocks more ancient still to afford materials for the deposition of these pre-Laurentian strata. Starting with the Laurentian rocks, he had shown that the phenomena of metamorphism of strata had been continued from that date all through the later formations, or groups of formations, down to and including part of the Eocene strata in some parts of the world. In like manner he had shown that ordinary volcanic rocks have been ejected in Silurian, Devonian, Carboniferous, Jurassic, Cretaceo-oolitic, Cretaceous, Eocene, Miocene, and Pliocene times, and he had no reason to believe that volcanic forces played a more important part in any period of geological time than they do in this our modern epoch. So also mountain chains existed before the deposition of the Silurian rocks, others of later date before the Old Red Sandstone strata were formed, and the chain of the Ural before the deposition of the Permian beds The last great upheaval of the Alleghany Mountains took place between the close of the formation of the Carboniferous strata of that region and the deposition of the New Red Sandstone The deposition of salts from aqueous solutions in inland lakes and lagoons appears to have taken place through all time, and it is going on now In like manner fresh water and estuarine conditions are found now in one region, now in another, throughout all the formations or groups of formations possibly from Silurian times onward; and glacial phenomena, so far from being confined to what was and is generally still termed the Glacial Epoch, are now boldly declared by independent witnesses of known high reputation to begin with the Cambrian Epoch, and to have occurred somewhere, at intervals, in various formations, from almost the earliest Palæozoic times down to our last post-Pliocene "Glacial Epoch" If the nebular hypothesis of astronomers be true, and he knew no reason why it should be doubted, the earth was at one time in a purely gaseous state and afterwards in a fluid condition, attended by intense heat By and by consolidation, due to partial cooling, took place on the surface, and as radiation of heat went on the outer shell thickened Radiation still going on the interior fluid matter decreased in bulk, and, by force of gravitation, the outer shell being drawn towards the interior, gave way, and in parts got crinkled up, and this, according to cosmogonists, was the origin of the earliest mountain chains He made no objection to the hypothesis, which, to say the least, seems to be the best that can be offered, and looks highly probable But, assuming that it is true, these hypothetical events took place so long before authentic geological history began, as written in the rocks, that the earliest of the physical events to which he had drawn attention in this address was, to all human apprehension of time, so enormously removed from these early assumed cosmical phenomena that they appeared to have been of comparatively quite modern occurrence, and to indicate that from the Laurentian Epoch down to the present day all the physical events in the history of the earth have varied neither in kind nor in intensity from those of which we now have experience.

A vote of thanks was most cordially given to the learned President at the close of his address.

The Secretary, Captain Douglas Galton, in winding up the meeting, stated that the tickets taken up to that moment numbered

123 old life members, four new life members, 153 old annual members, 36 new annual members, 332 associates, 135 ladies, and seven foreign associates; together, 790.

The most important discussion in the sections which met on Thursday was that on the report of the committee appointed at Sheffield last year for the purpose of reporting whether it is desirable that her Majesty's inspectors of elementary schools should be appointed with reference to their ability for examining the scientific specific subjects of the code, in addition to other matters.

In the Geographical Section, the President read a correspondence embodying the latest news of the Royal Geographical Society's East African Expedition under Mr. Thomson, who was expected at home in November. The President paid an eloquent tribute to the courage of the young explorer, and bore testimony to the high character of the native tribes, whose fidelity when tried had been unshaken. By a report on the present state of the spectrum analysis, Mr Francis Galton suggested improvements on the present method of determining the heights and distances of clouds, and expressed the hope that some real advantage would be derived from the system of ballooning now carried on at Woolwich.

A soirée was given by the Mayor of Swansea in the evening.

On Saturday the only sections which sat were the Mathematical and the Mechanical. The other sections made no pretence of holding a sitting, and kept strict holiday.

There were numerous excursions, adapted to all tastes, but that which was expected to yield the greatest results, if not the most pleasure, was to the peninsula of Gower, which is so rich in geological and entomological varieties. It was arranged that a mound, supposed to be a tumulus should be opened under the personal supervision of Mr. Hussey Vivian, M.P., and it was hoped that this mound would turn out to be not less interesting than the so-called "graves" opened some years since by Sir John Lubbock. The supposed tumulus, however, was a blank draw. It was not a place of sepulture, but simply a gravel and boulder heap, thought to have been accumulated by the centripetal action of two small streams which meet here.

Mr. Seebohm delivered a lecture in the Music Hall on "The North-East Passage," but, though professedly given for the working classes, there were very few working men present.

On Monday the Economic Section opened under the presidency of Sir Antonio Brady, in the temporary absence of Mr. George Woodyatt Hastings, M.P., who, however, was able to be present later in the day, when he delivered an address on the value of statistics. A cordial vote of thanks to the president was passed, after which a discussion took place on a paper read by Sir Antonio Brady, in the absence of the writer, Mr. G. Baden Powell, the subject matter being the lessons taught by protection in the United States. In the discussion which followed the whole question of free trade and protection was opened up, but, with the exception of a vote of thanks being passed to Mr. Baden Powell, no formal motion was made. Mr. F. N. Newcombe then read a paper on diminishing annuities.

In the Mathematical Section, Mr. J. Shoolbred brought up the report of the Committee on Tidal Observations in the English Channel; Mr. Bottomley the report of the Committee for Making Experiments on the Elasticity of Wires; and Mr. Gill the report of the Committee on Pendulums. The Hon. F. A. Russell read a paper on the "Absorption of Radiant Heat by Films of Water." Mr. Courtenay Fox, in his paper "On Some Laws which Regulate the Succession of Temperature and Rainfall in the Climate of London," arrived at the following conclusions. 1. A cold spring is very prone to be followed by a hot summer; a cold summer tends to be followed by a cold autumn; and a cold autumn has a slight tendency to be succeeded by a winter of low temperature. 2. Warm summers are generally followed by warm autumns. 3. In no fewer than eight out of the twelve months (that is, in every one except February, March, May, and October) very low temperature tends to be prolonged into the succeeding month. 4. If June, July, August, or December be warm, the next month will probably be a warm one also. 5. Two months, June and July, tend, when very dry, to be followed by dry ones. On the other hand, a dry August indicates the probability of a wet September. 6. A wet December is apt to be succeeded by a wet January.

In the Geographical Section, presided over by General Thullier, Lieutenant R. Ivens, a member of the Portuguese expedition party to West Central Africa, gave the results of the expedition, which was carried out at the expense of the Portuguese Government; and Mr Laurence Oliphant read an interesting paper describing his travels east of the Jordan, where he went for the purpose of surveying a road for a proposed line of railway to the valley of that river.

Professor J. Prestwich read a paper on the geological evidence of the submergence of the south-west of Europe during the early human period. He thought that there was clearly such submergence, which swept away the older mammalia and Palæolithic man. Whether Neolithic man descended from some Palæolithic tribe which escaped to the highlands, or whether he subsequently emigrated from the East, he could not say, but Neolithic man evidently appeared after an alluvial period. A long discussion took place on the theory here suggested, but the opinion of the section was against any sudden wide sweeping submergence.

In the Anthropological Division, Dr. Phene read a paper, in which he described the retention of certain ancient pre-historic customs in the Pyrenees, and amongst them the practice of serpent worship.

Mr. Ernest Benedict, in the Mechanical section, read a paper showing the feasibility of constructing a Channel Tunnel, and the president (Mr. Abernethy) expressed himself favourably towards the boring experiments now being carried on at Dover.

On Tuesday the papers were, as a rule, got through as quickly as possible, discussion, even when it did take place, not being conducted with much energy, and nearly all the work for the day was concluded before one o'clock. An excursion to the waterworks was largely attended, and the members were entertained to luncheon by the corporation.

Lieut. Temple, R.N., read a paper before the Geographical section on Nordenskjold's recent voyage in the Vega.

Lieut. Col. Tanner read a paper descriptive of some of the tribes in Northern Afghanistan. He considered that the Indian Government should make a recruiting ground of this country, where there were hundreds of fine fellows who would be only too glad to join our army if sufficient inducements were held out to them. On moving a vote of thanks, the President (Lieutenant-General Lefroy) referred to the great advantages which would hereafter be derived from the topographical labours of the officers now with each column of the British force in Afghanistan.

Dr. Phene described some of the remarkable objects which he had found in the Balearic Islands. He also read a paper giving the results of a recent examination of the topography of the Troad, and said that during several successive visits to the plains of Troy his attention had been drawn to the former course of the Scammander from remains of irregularities in the surface, indicating former defence by earthworks, and also to earthworks, indicating, as he thought, Trojan interments.

In the Zoological and Botanical department of the Biological section, Dr. Sclater exhibited the first volumes of zoological reports of the voyage of the Challenger. He also read a paper on the classification of birds.

In the Anthropological Department, Miss Buckland read a paper on evidences of surgery and superstition in Neolithic times—for example, trepanning children for the prevention of epileptic and convulsive fits. Professor Rolleston, in describing the crania of bushmen, stated that they were not of so degraded a type as had been popularly supposed. Judging the skulls of bushmen by well recognised principles, they must have possessed very considerable intelligence.—Mr. Hyde Clarke detailed the results of his further researches of the pre-historic relations of the Babylonian, Chinese, and Egyptian characters, language, and culture, and their connection with sign and gesture language.—Lieutenant Temple gave an account of some curious customs amongst the mountain Lapps of Norway.

In the Economic section, Mr. Westgarth examined the contradictory replies of economists to the question, What is capital? and concluded by saying that ever since Adam Smith's day there has been a prevalent notion that capital must at last grow so abundant that profit or interest upon it would all but cease. It would fall so low, said economic opinion, that there would be no longer sufficient motive to save any more of it. But such a view was a complete misreading of the facts of life. There was a constant economising tendency to do with the least possible capital, and on the other hand a constant demand for more and more of it with the extension of exchange operation. The combined effect was to maintain capital and insure for it everywhere a permanent and substantial remuneration.

The Mechanical Science Section sat for only a brief time, the greater part of which was taken up by Mr. W. E. Hall, who, by means of geometrical drawings and a variety of experiments with models, endeavoured to demonstrate that the Plimsoll Royal Commission could not determine the load line of a ship. Mr. Hall claimed for his method that it was a first attempt to give a proportional division of the displacement of ships.

A deputation of delegates from various scientific societies to the association met for the purpose of inducing the council of the association to assemble a day or two before the opening of the congress each year, in order to discuss scientific matters, and to visit places of antiquarian, archæological, or other interest in the district where the association is to assemble. No section met on Wednesday. Some papers which were not read on the previous day have been allowed to stand over and take their chance at the next meeting.

At a general meeting of the committee, it was resolved that the following grants of money, amounting to £1,010, should be made for scientific purposes: Mathematics and Physics—Mr. G. H. Darwin, lunar disturbance of gravity, £30; Professor Everett, underground temperature, £20; Professor Carey Foster, electrical standards, £100; Mr. James Glaisher, luminous meteors, £15; Dr. Joule, mechanical equivalent of heat, £40; Dr. O. Lodge, high insulation key, £5; Professor Sylvester, fundamental invariations, £40; Sir William Thomson, seismic experiments, £30; Sir Wm. Thomson, tidal observations, £10; Mr. J. M. Thomson, inductive capacity of crystals and paraffins, £10. Chemistry—Dr. Gladstone, specific refractions, £10; Lord Rayleigh, spectrum analysis, £10. Geology—Professor Duncan, fossil polyson, £10; Mr. J. Evans, geological record, £100, Professor E. Hull, underground waters, £10; Professor A. C. Ramsay, earthquakes in Japan, £25; Dr. Sorby, metamorphic rocks, £10; Professor W. C. Williamson, tertiary flora, £20. Biology—Dr. M. Foster, Scottish zoological station, £50, Dr M. Foster, Naples zoological station, £75; Lieutenant-Colonel Godwin Austen, natural history of Socotra, £50; Mr. Gwyn Jeffreys, exploration of sea bed north of the Hebrides, £50; General Pitt Rivers, anthropological notes, £20; Dr. Pye Smith, elimination of nitrogen during bodily exercise, £50; Professor Rolleston, prehistoric remains in Dorsetshire, £25; Mr Sclater, natural history of Timorlaut, £50; Mr. Stainton, zoological record, £100. Economic Science and Statistics—Mr. F Galton, estimation of weights and heights of human beings, £30. Mechanics—Mr. Bramwell, patent laws, £5, Mr. James Glaisher, wind pressure on buildings, £5; Professor Osborne Reynolds, steering steamships, £5, making a total of £1,010.

At the concluding meeting Mr Hussey Vivian, M.P, moved the thanks of the meeting to Professor Ramsay for his presidential address. The President, in his reply, referred to his visit to Swansea in 1848, and his personal recollections of De la Beche and Edward Forbes Since then he had not visited the town until now and he was greatly struck at the great strides which had been made in improvements, and towards commercial development. He said that his address had cost him great labour, not in the printing, but in the thinking out of his subject, which for years had been gathering in his mind, and he seized on the present occasion as a happy one for bringing a very large subject before the public Some persons thought there was antagonism between the practice and theory of geology, but his impression was the reverse of that. He thought the theoretical made the best practical geologist, for they could see through stones to a much greater depth than those who regarded them in a merely superficial manner. This statement he illustrated by citing instances of theoretical geologists accurately determining the existence of coal beds and of water by mere superficial examination of a district, and so saving the trouble and expense of haphazard borings

The next meeting, which will be opened at York on August 31 next year, is looked forward to with unusual interest. The celebration of the Association's jubilee will probably be an event in its not uneventful history. Financially speaking, the present meeting has been unsuccessful The total receipts amount to only £899, as against £1,736 received at Sheffield. The Association tickets issued at Swansea were 389, as against 522 at Sheffield The number of ladies' tickets was less than one half, being 147 against 351; but whilst no tickets to foreigners appear to have been issued at Sheffield, there were twelve issued at Swansea. The total number of tickets issued was 915, made up as follows: Old life members, 144, new life members 41, associates 389, ladies 147, and foreigners 12. The total receipts amount to £899, the smallest amount since the Association meeting at Hull.

IMITATION OF OLD SILVER.—The *Revue Industrielle* gives the following process for giving to any silver plated or silver article the characteristic appearance of antique plate. The article is dipped in a bath of water containing about 10 per cent of sulphide of ammonium and then scratch-brushed with a brush made of glass threads or "bristles." When afterwards burnished with an agate tool its surface becomes a beautiful dark brown colour.

Proceedings of Societies.

BRITISH ARCHÆOLOGICAL ASSOCIATION.

MAY 26.—Mr. H. Syer Cuming in the chair. —It was announced that the council had accepted the invitation of the Mayor and Corporation of Devizes to hold the Congress in that town in the autumn. Several places of antiquarian interest in the locality will be visited.—A letter was read from the Rev F. Smith, of Woodchester, reporting the intention of opening some of the magnificent pavements of the Roman villa there if funds are available. Funds are wanted for the work of uncovering and for erecting a protecting building over them that they may be always open to view. Any amount will be gladly received if sent to the Rev. F Smith, Woodchester, or to Mr L Brock, Hon. Sec of the Association.—The discovery of a Roman villa at Castor was announced. It is about a quarter of a mile from the station, and a pavement of squared stone has already been opened —Mrs. Cope exhibited a brass ring of fourteenth century date, found at Berkhampstead.—The Rev. S M. Mayhew described a bronze censer of Roman date, and several other articles recently found in London —Mr. T. Morgan exhibited a first brass coin of Trajanus Decius from Melrose, which appeared to refer to the Dacian campaign —Mr C. Brent exhibited a singular example of early-looking pottery from the South Seas, and Mr. L Brock described a large number of articles from London Wall. These were mostly of Roman date, but among them was a bone instrument for steadying parchment when in the hands of the writer, of Saxon date, found in the same place Several prehistoric implements of jadite from the Mentone caves were also shown—Dr. Stevens sent notes on the discovery of flint implements in Reading Drift, where they have not hitherto been met with.—The first paper read, by the Rev S M. Mayhew, was descriptive of the remarkable Roman villa at Sandown, Isle of Wight, now being opened by Capt Thorpe Drawings of some of the pavements were shown, one being of great beauty. Capt. Thorpe has discovered the positions of two other buried villas at no great distance —The second paper, by Mr. Bradley, was upon the measurements of Ptolemy applied to the southern and western shores of Britain, in reply to a similar paper read before the Association by Mr G Hills on a former occasion. In Mr Hill's absence some further explanatory notes were read by Mr. W. de Gray Birch —The third paper was by Mr W. C. Dymond, and was descriptive of the great British camp at Worlebury, Weston-super-Mare. After giving details of the remarkable walls, the author proceeded to describe the approaches, and expressed a doubt as to the existence of the supposed platforms for slingers, a remarkable and unusual feature of the external defence, which have been pointed out, apparently erroneously, by former writers. The paper was illustrated by carefully prepared plans.

JUNE 3.—Mr. Syer Cuming in the chair. —It was announced that the Devizes Congress would commence on the 16th of Aug., the Earl Nelson having been elected President for the Congress and the following year —The death of Mr. Planché, Vice-President, was referred to in fitting terms.—Dr. Stevens announced the discovery of Roman remains at Carton, Wilts, in a position that appears to indicate the existence of buildings at no great distance.—A seal was exhibited with an inscription, "Johanna de Breneford."—Dr. Kendrick exhibited a curious wooden spoon, with the crowned heart of the Douglas family; Mrs M Hyde a silver goblet, with portraits in relief.—Dr. Woodhouse described the progress of the demolition of old Fulham Church, and produced several early flooring tiles. The monumental slab of Bishop Hinchman has also been found.—Mr W Money exhibited photographs of the carved bosses of the roof of St, Nicholas' Church, Newbury, which are boldly carved with the emblems of our Lord's passion.—The Rev. S. M Mayhew described several beautiful objects of antiquity, and also a portrait of the Duke of Cumberland painted on glass.—Mr. C. Brent exhibited a curious MS., relating to accounts paid by Cecil, Lord Burleigh, 1593.—The first paper was by Mr. C. W. Dymond, on "Cup Markings on Burley Moor," and was read by Mr W de Gray Birch. It was descriptive of a series of these curious markings on a stone of large size which had hitherto escaped observation.—The second paper was on the site of the village of Wrangholm, near Old Melrose, the birthplace of St. Cuthbert, by Mr E Frier, and was read by Mr. L. Brock The third paper was by Mr. T. Morgan, on Roman inscriptions from Italy, and now built up in the walls of a mansion at Higham, Kent. They are all sepulchral in character, and are mostly surrounded with architectural borders of great beauty They were brought to England in the last century, when the collection of classical antiquities was so prevalent. The paper is the second of a series on similar collections in England, and it is to be hoped that others may follow, that a permanent record may be kept of those contributions to history, which are at present difficult of access or comparison —Mr G. Wright reported the arrangements for the Congress, and named the places to be visited.

ROYAL SOCIETY OF LITERATURE.

MAY 26.—Sir P. de Colquhoun in the chair. —Dr Abel read a paper on "The Diversity of National Thought as reflected by Language," in which he endeavoured to show that with the exception of terms denoting material objects or expressing most ordinary sensations, the words of all languages are really different in meaning from their reputed representatives in other tongues As nations differ in their notions, the signs expressive of those notions, *i.e.*, the words, could not but differ in the senses they conveyed By a comparison between French, German, and English, Dr. Abel showed that there was a considerable diversity between words seemingly identical in meaning Such words often only corresponded partially with each other, the one having either some additional meaning not found in the other, or the various ingredients of their meanings being combined in different proportions, even when otherwise identical. Then, again, there were terms found in some languages but not occurring in others, in which cases, to make up for the deficiency, it was necessary to use paraphrase Dr. Abel then pointed out that only thoughts common to a whole nation, or to large sections of a nation, are embodied in single words, and hence drew the conclusion that the finer shades of national character are most effectually ascertained by a comparison of synonyms.

QUEKETT MICROSCOPICAL.

MAY 28.—Dr T S. Cobbold, President, in the chair.—Four new members were elected. —The list of donations included a series of twenty slides of the genus Pulex, also a remarkably large specimen of the same genus, species undescribed.—Dr. M C. Cooke read a paper on "The Results of some of the Field Excursions of the Society," with classified lists of objects found A discussion followed as to the best means of collating and preserving lists of similar kinds during successive seasons, as contributions towards the knowledge of the distribution of the microscopic Fauna and Flora of the London district.—Mr. A. D. Michael read a paper on "Two Species of Acarina not hitherto recorded as British."

ANTHROPOLOGICAL INSTITUTE.

MAY 25.—E. B Tylor, Esq., President, in the chair.—Mr H. Woodward read extracts from a paper by Prof J. Milne, on "The Stone Age in Japan." The author described from personal examination many of the archæological remains in Japan. "Kitchen middens are abundant, and are ascribed to the Ainos, the ornamentation on the pottery resembling that still used by the Ainos of to day. The shells and bones found in the middens were enumerated and described. The stone implements found in Japan include axes, arrow-heads, and scrapers. Many of these occur in the middens; the axes are formed generally of a greenish stone, which appears to be a decomposed trachytic porphyry or andesite. The Ainos used stone implements up to a comparatively modern date. Tumuli occur in many parts of Japan, as well as caves, both natural and artificial Prof. Milne opened one of the latter, and found the interior covered with inscriptions. The Japanese themselves make valuable collections of stone implements, old pottery, &c., the favourite notion among them being that such things were freaks of nature Several fragments of pottery, shells, and other remains from kitchen middens were exhibited —Mr. C Pfoundes read a paper on "The Japanese People, their Origin, and the Race as it now Exists." Passing over the fabulous period, we find the Japanese commence their era about the same time as that of Rome, B C 660; the first emperor, mikado, or ruler established himself in the vicinity of Kiote, not very far from the present treaty ports, Osaka-Kiogo. For centuries history teems with accounts of efforts to civilise the people, and the wild and intractable aborigines were gradually driven northward, until they settled in the North Island, where they still exist, and form the bulk of the present inhabitants. Mr. Pfoundes exhibited a valuable collection of photographs and drawings in illustration of his paper, together with articlés of Japanese manufacture and some fine specimens of tapestry.

SOCIETY OF BIBLICAL ARCHÆOLOGY.

JUNE 1.—Mr. W. Morrison in the chair —Lieut -Col. Warren read a paper on "The Site of the Temples of the Jews at Jerusalem."

MINERALOGICAL SOCIETY.

JUNE 1.—Prof. T G Bonney. V.P, in the chair.—The following papers were read: on "A New Face on Crystals of Stilbite from Scotland and Western Australia," by the President; on "A Portable Chemical Cabinet for Quantitative Work," by Mr. A. E. Arnold; and on "Kaolinite and Kaolin," by Mr. J. H. Collins on "New Scottish Minerals," by Prof. Heddle; and "Further Notes on Mineral Growth," by Mr. T. A. Readwin.—Interesting specimens of minerals were exhibited by Messrs. F. W. Rudler, T A Readwin, J. R. Gregory, and W. Semmons.—Messrs. G. N. Walker, A. Murray, G. S Mackenzie, and H. Furnhjelm were elected ordinary members, and Mr. R. M. Heddle an associate.

ROYAL INSTITUTION.

JUNE 7.—G. Busk., Esq, Treas. and V.P, in the chair —Dr C. A Gordon, Dr. A. C. Macrae, Dr. C. M. Tidy, Messrs. T. Forster, J. Steel, W. S. Steel, and A. Taylor were elected members.

MUSICAL ASSOCIATION.

JUNE 7.—W. H. Cummings, Esq., in the chair.—Prof. Macfarren delivered an address on the subject of the "Lyrical Drama." In the course of a lecture of exceptional interest, the professor traced the progress of song in connection with the drama, from its earliest rudimentary form in the Greek drama, through the first Christian Passion plays, to the period of the Renaissance, dwelling somewhat afterwards on many individual composers, as Monteverde, Scarlatti, Lulli, Purcell, Keiser, Handel, Gluck, Mozart, &c., pointing out each of the more important steps in the growth of the lyrical drama, and illustrating his subject by examples so admirably selected and vividly described that the audience (without a note of music) were able to follow Dr. Macfarren's arguments and deductions with ease and pleasure.

LIBRARY ASSOCIATION.

JUNE 4.—Prof. Jevons in the chair.—Mr. C. Walford read a paper entitled "Books I have seen, Books I have not Seen, Books I should like to See, Books I never expect to See." In the first category he placed a work which for a long time he thought would belong to the last It was the first book that Benjamin Franklin printed, and is entitled "Ways and Means for the People of Delaware to become Rich, 1725." Written by Mr. Francis Rawle, member of an old Cornish family, it contains many useful hints on insurance, saving, and other branches of political economy; but, being no larger than a pamphlet, it gradually disappeared from the book market, and only two copies were known to exist, one in Philadelphia and one in the British Museum Neither of these was Mr. Walford able to see; but, fortunately for him, Mr. W. B. Rawle, a descendant of the author, had reprinted the tract in a small edition, and presented Mr. Walford with a copy, which was exhibited at the meeting. Other curious pamphlets on plagues, the Fire of London, comets, usury, &c., were exhibited, and illustrated by notes historical and critical; but to exhaust the subjects of his paper the reader said would require the patient indulgence of his audience at a future meeting.

ENGLISH SPELLING REFORM ASSOCIATION.

JUNE 1.—Mr. A. J Ellis in the chair.—Mr. F. G. Fleay read a paper in which he examined upon general principles how a European alphabet could best be formed, and in what way a reformed English alphabet would best lead up to it. The results obtained were that only vowels admit of systematic treatment on the basis of the Latin alphabet; that three new vowel types would be sufficient for our language, and that one modifying mark should be used to distinguish wide from narrow vowels (in English this is nearly the same as long from short vowels), while for consonants six new types would have to be introduced. For present use as an introductory system one new type and one modifying sign would be sufficient. A further examination of proposed methods showed that diacritics, cut or turned letters, were undesirable; that new digraphs should not be introduced, and old ones only temporarily retained New types must ultimately be introduced, except for the distinction of vowel classes, which could be indicated by a modifier.—The reading of the paper was followed by a long and animated discussion.

JUNE 28.—Annual meeting.—Dr. W. H. Hunter in the chair.—The report stated that considerable progress had been made in the classification of schemes of spelling reform, and in making the subject known to the public.

STATISTICAL SOCIETY.

JUNE 15.—Dr. William A. Guy, F R.S., in the chair.—The following gentlemen were elected Fellows: Right Hon. J. Chamberlain, Hon. W. Egerton, Messrs. S. Leighton, C. Schreiber, J. W. Pease, R. J. More, W. L. Jackson, G. Readdy, W. S. Caine, J. C. Bolton, W. Y. Craig, J. Lovegrove, G H. Finch, J. Rankin, C. Seeley, jun., and C. H. Crompton-Roberts; and the under-mentioned were elected honorary members of the society: His Excellency M. Léon Say, the Hon. Charles F. Conant, and M. le Dr. J. Bertillon.—The paper read was by Mr. R. P. Williams, on "The Increase of Population in England and Wales."

NEW SHAKSPERE.

JUNE 11.—Mr. Furnivall, Director, in the chair.—The Rev. H. N. Ellacombe read a paper on "The Seasons of Shakspeare's Plays." He found the seasons marked in eight comedies, five histories, and eight tragedies, by mentions of flowers, plants, or other indications. For instance, in the "Midsummer Night's Dream," though its days were April 29th, 30th, and May 1st, its English flowers were midsummer ones; and the distinction was worth noting between the "blowing" of the wild thyme, which would be then at its fullest, and the "growing" of the oxlips and the violet, which had passed their time of blowing, but the living plants continued "growing." In the "Winter's Tale" the flowers named are all summer flowers, carnations or gilliflowers, lavender, mints, savory, marjoram, and marigold. And so with other plays.—Mr. Furnivall read a paper on "The Failure of Mr. Swinburne's Metrical Argument against Fletcher's Share in 'Henry VIII.'" The argument was that Fletcher did not write the share assigned to him because it did not contain "the perpetual predominance of those triple terminations so peculiarly dear to Fletcher." But this argument was absolutely worthless as a test of Fletcher's work, because the share in "The Two Noble Kinsmen" which Mr. Swinburne and other critics assigned to Fletcher contained far fewer of these triple endings than his share in "Henry VIII.," a fact which Mr. Swinburne had forgotten to find out before bringing forward his argument.—The Rev. J Kirkman read a paper on "Suicide in Shakspeare."

WE notice in the *Scientific American* of June 26th, a description and illustration of a so-called new invention for ventilation of boots and shoes patented in America by a Mr. McDonald. This invention is, we think, an exact counterpart of a patent secured in England by George Smith, dated January 7, 1873, No. 70. It seems very peculiar that in the face of this patent the examiner should allow a patent to issue seeing that in the case of English inventors applying for U.S. patents, not only are direct similarities adverted to, but very indirect or side issues are brought in question rather than main facts.

GOLD MINING IN ENGLAND.—Gold in unworkable quantities has frequently been found in this country, and considerable excitement just now exists in the neighbourhood of the Kildonan gold-diggings, Sutherlandshire, in consequence of the active steps now being taken for thoroughly testing the gold-producing properties of quartz taken from various points in the strath. It appears that a German chemist of much experience has discovered a process which gives excellent results. It is almost entirely chemical, and costs but little to carry on. Australian miners express their astonishment at the striking resemblance between the Sutherland and the Australian goldfields.

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SUBJECT MATTER INDEX OF APPLICATIONS FOR PATENTS.

August 20th to September 20th inclusive.

The following Index gives first the class, then the name of the Inventor. In this list (com.) means Invention communicated from abroad. Further information as to the progress of these Patents by Notice to Proceed, Sealing, and Specifying, can be obtained at the Office, 21, Cockspur Street, Charing-cross.

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Finishing and Dressing Woven Fabrics, Yarns, and Threads, &c.—W. W. Urquhart and L. Lindsay.

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Fire Places, Stoves and Ranges, Fenders and Fire-Irons—C. Weekes, J. Love, T. H. Williams, R. Neville.

Fishing, Fishing Tackle.—G. J. Archer, C. W. Harding

Floor-cloths and similar Coverings for Floors.—W. R. Lake (com.)

Fountains.—W. R. Lake (com.)

Fuel (Artificial), Fire-lighters, &c—C. Weekes.

Furnaces and Fire-boxes, Supplying Furnaces with Fuel—J. H. Johnson (com.), C. Weekes, J. Love, A C. Engert, D. A. Hornell, J. Parker, G. and A. S. Bower.

Furniture, Upholstery, Cabinetwork, &c.—J. Keat, W. R. Lake (com.), H. Kinsey, L. Siegenberg, G. A. Dallas.

Games and Exercises Billiards and Bagatelle Markers and Indicators for Games, Gymnastic Apparatus.—H. B. Fox, W. R Lake (com.), W. Rowley, J. F. Armistead, W. R. Lake (com.), N. Salamon, C. R. Hall.

Gas, Gasometers, Holders, and Retorts.—C. Hessel, W. R. Lake (com.), W Foulis, J. A. Stephan, J. F. Parker, A. Pope, W. M. Jackson.

Gas and other Burners.—S. and F. R. Chatwood.

Gas Regulators.—J. Haworth, D. B. Peebles.

Glass (Making and Treating) and its Applications.—E. Andreoli (com.), M. Barlow (com.), S. Neville, E. Parry and T. H. Cobley, W. H. Stuart.

Gloves, Gauntlets, Mittens.—J. Trefousse.

Governors for Engines and Machinery.—J. Kennedy, A. S. F. Robinson, J. G Jones.

Grain and Seeds (Treating, &c.)—W. Davidson, W. R. Lake (com.), F. Wirth (com.)

Grinding, Crushing, and Disintegrating Corn. Grain and Seeds, and Dressing Flour.—W. R. Lake (com.), J. Currie, G. T. Smith and W. H. Dickey.

Grinding Miscellaneous Substances.—J. Beresford, J. A. Birkbeck.

Grinding and Polishing, Smoothing and Surfacing, Emery, Sand, and Glass Papers, Cloths, and other Substances.—F. Rixon, J. Beresford.

Hairdressing, Shaving, Pomades, &c—F. T. Lawrence, W. F. Brown.

Harness, Saddles, Curbs, Whips, Releasing from Harness, Grooming Horses, Nosebags.—C. S. Cooling.

Hatching and Incubating, Rearing Birds, &c. —C. H. Dunn and H. T. Cartwright.

Hats Coverings for the Head, &c.—L. Hutchings, W. Hyman, J. Christie.

Heating, Warming, and Evaporating, Obtaining and Regulating Heat, &c —W. R. Lake (com.), J. H. Johnson (com.), F. Hart, J. Storer, F. A. Bonnefin, L. W. Leeds, A. Pope, E. Fitch.

Hoists, Cranes, Capstans, Windlasses, Raising, Lowering and Moving Heavy Bodies, Raising from Mines.—A. B. Brown, M. Bauer (com.), A. J. Stevens, W. R. Lake (com.), C. D Abel (com.)

Horse Shoes, Shoeing Horses, Shoes for Animals, &c.—W. E. Jones, W. W. Clark and J. Priestley, W. W. Box and F. J. Beadle.

Injectors, Ejectors, Jet Apparatus.—E. A. Brydges (com.)

Inks, Inkstands, &c.—A. Ungerer.

Insulating, &c.—G. Barber (com.), A. E. Gilbert.

Iron (Salts and Oxides).—W. T. and J. Chadwick and J. W. Kynaston.

Ironing, Smoothing Irons, &c.—A. Norris.

Jars, Jam Pots, &c.—J. Cole, H. Mardon, A. V. Langstedt.

Jewellery, &c.—W. Hardy, W. R. Lake (com.).

Knitting, Tatting, Crocheting, &c.—H. Kohnes and L. Pogel, F. W. Sowarzbach.

Knives, Forks, Table Cutlery, Knife Cleaners. —J. Beresford.

Lamps, Lanterns, Chandeliers, Candlesticks, Lamp Furniture, Glasses and Shades, Lighting, Producing Light.—H. Thallon, C. H. Frome and G. C Gibbs, H. Clinch, W. C. Hughes, F. McD. Robertson, A. Pope, A. M. Clark (com.), C. W. Ritto and W. H. Thompson, S. and G. R. Chatwood, A. Mackay.

Lavatories, Washing Basins, &c.—L. Segenberg.

Lead (salts and oxides).—H. Koenig.

Leather, Skins, Hides, Artificial Leather and Parchment, Currying, Tanning, Cutting, and Ornamenting Leather.—F. Wirth (com.), A. M. Clark (com.), J. M. Jones, R. Brown.

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Letters, Figures, &c.—J. H. Wilson.

Life-buoys, Life Preservers, Rafts, Life-boats. —R. Graham and C. E. A. Baloche, T Foster.

Lime, &c.—E. Parry and T. H. Cobley.

Liquids —J. Storer.

Locks, Latches, Bolts, Lock Furniture, Keys.—G. C. Emery, G. W. von Nawrocki (com.), E. du Sart (com.), J. Hart, M. H. St. Aubin, E. Collins.

Magnesium, &c.—E. Parry and T. H. Cobley.

Mangles, &c.—H L. Wilson and J. Clegg

Matches, &c.—A. M. Clark (com.), J. Jacoby.

Mathematical Instruments.—T. Pocock and J. Selten, W. H. Wheeler, J. F. Armistead.

Medicines, &c.—W. E. Gedge (com), W. Williams, E. P. Alexander (com.), W. Brierley (com.).

Metallic Alloys.—C. F. Claus, W. R. Lake (com.)

Metals (Annealing, &c.).—C. H. Onions.

Metals (Casting, Moulding, &c.)—J. J. Sachs.

Metals; Cutting, Planing, &c.—F. Deering and J. Morrison, G R. Postlethwaite, E. H. Bennett.

Metals (Forging, &c.) —F. Rixon, A. C. Kirk, G. W. von Nawrocki (com.)

Metals (Plating and Coating, &c.). — E. Parry and T. H. Cobley, W. R. Lake (com.)

Metals (Smelting, Extracting and Reducing Metals, Heating Ores, Refining, Tempering, and Annealing Metals, Manufacture of Iron and Steel, Metallic Alloys, &c.)—P. B. Wilson, J. F Parker, J. P. Dunker.

Meters, Measuring Liquids and Fluids, &c.—H. J. Haddan (com.)

Milk, &c.—G. F. Griffin, E. Fitch.

Mining, Boring and Blasting Rock, Raising from Mines, Getting Coals, Draining, Lighting, and Ventilating Mines.—W. H. Thompson and F. G. Henwood, A. R. and H. Strachan. R. Oliver, F. Hurd, M. Bauer (com.), A. J. Stevens, A. M. Clark (com.), J. G. Marquardt.

Mixing, Kneading, Mashing, Stirring, Agitating, &c.—J. Liddall, T. A. Grobert.

Money Tills and Boxes.—G. Absell.

Motive-power Machines, Obtaining Motive power.—J. Roberton, G. Temple, R. Wilson, W. Wilson, W. Adair, F. G. Willett.

Mouldings, &c.—C. Brothers.

Muffs, &c.—W. Hyman.

Musical Instruments, Music, &c.—W. and T. H. Lowe, J. Gautier, R. Howson.

Nails, Spikes, Bolts, Rivets, Screws, &c.—W. Clark (com.), R. C. Perry, W. W. Clark and J. J. Priestley, H. Sharrow and T. King.

Neckties, Scarfs, Bows, Cravats.—W. F. Brown.

Needles, &c.—F. W. Schwarzbach.

Nuts and Washers.—H. Anderson.

Oiling or Lubricating, &c. — A. M. Clark (com.)

Packing, Storing, Baling, &c.— C. Kesseler (com.)

Paper, Pasteboard, Papier Mache: Paper Hangings. — W. Green, J. Hawthorn, F. U. Miller.

Pens, Pencils, &c.—N. Treinen, J. J. Sachs, J. Nadal, B. S. Cohen (com.)

Photography and Photographic Apparatus, Pictures, Portraits, &c.—F. M. B. Bertram, W. Morgan-Brown (com.)

Pipes, Tubes, and Syphons: Joining Pipes.—F. Rixson, H. Doulton, S. Mason, J. Page.

Preserving and Preparing Articles of Food.—T. Beresford, E. Parry and T. H. Cobley, F. A. Groebert, G. F. Griffin, C. W. Harding, A. M. Clark (com.)

Presses, Compressing, &c.—F Neville, W. C. James, G. R. Postlethwaite, C. D. Abel (com.)

Printing and Transferring: Type and other Surfaces for Printing, Composing, and Distributing Type.—J. Lloyd, A. Ungerer, A. J. Parker, W. R. Lake (com.), J. Blakey, S. Collinge and H. G. Grant, J Dittrich and P. Ganty, A. Rycroft, D Donald, T. A. Middleton.

Propelling Carriages, &c.—E. Edwards, W. Schmid.

Propelling Ships, Propellers, Paddle-wheels and Screws.—J. Taylor, W. J. Griffiths, G. F. Harrington, F. Engel, T. P. Walker, C. Jones, H Montgomerie.

Pumps, Pumping and Raising Water and other Liquids, Pumps, Pistons, and Packing.—G. McCallum and T. T. Harris, F. C. Simpson and J. Denison, W. Payton and A. Wilson, W. P. Thompson (com.)

Punching or Perforating —F. Deering and J. D. Morrison, G. R. Postlethwaite.

Railways, Carriages, Coupling, Uncoupling, and Altering Position of Carriages and Engines.—R. F. Fairlie, W. Schmid, J. H. Southwood, T. Hannay, J. Le Clair and J. D. Rees

Railway, Permanent Way, Rail Joints, Chairs and Sleepers, Portable Railways, Atmospheric Railways, Switches, Points, Crossings, and Turn-tables.—W. Clark (com.), E. E. Talbot, R. J. Hinton and S. W. Yockney, J. Holden, W. R. Lake (com.), S. Lloyd.

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Refrigerating, Cooling Liquids, Making Ices, —J. Sturgeon, A. M. Clark (com.)

Registering, &c.—A. Rouselle and J. Marriotte, M. Beber, W. R. Lake (com.), G. W. Warren, G. Absell.

Roads, Paths. &c.—O. Williams.

Ropes, &c.—H. A. Bonneville (com.)

Salt, &c.—R. J. T., A. F., and H. L. Hawksley.

Scents, &c.—F. Cooper.

Screens, &c.—W. A. Barlow (com.)

Screws, Screw Drivers, &c.—R. C. Perry, G. W. von Nawrocki (com.)

Sewing and Embroidering. — E. Ward, W. Marsh and J. Morris, W. Webster, A. C. Henderson (com.), M. Gandy.

Ship and Boatbuilding.—W. E. Gedge (com.), T. Foster, J. F. Fisher, J. D. Ellis, G. Allix.

Ships' Cargoes (Loading, &c.) — P. G. B. Westmacott.

Ships' Rigging, Sails, &c.—W. Webster.

Shirts, Collars, &c.—H. B. Fox.

Shot, Shell, Bullets, Cartridges, Percussion Caps, &c.—C. D. Abel (com.)

Show Cases, &c.—F. M. B. Bertram.

Shutters.—T. Pearson and J. Taylor.

Sifting, Sorting, and Separating. — W. R. Lake (com.), T. H. Williams.

Signals, Alarms, Communicating Apparatus, Conveying Sounds.—A. F. St. George, W. Clark (com.), J. F. Fisher, C. Gaunt, C. W. Mester, F. W. Jones, A. M. Ritchie, W. R. Lake (com.)

Slag, &c.—J. A. Birkbeck.

Spinning and Preparing for Spinning.—J. H. Johnson (com.), J. C. Mewburn (com.), H. Marsden, G. Howarth and W. Cowbourn, B. Berry and S. S. Freeman, G. and E. Ashworth, G. Young, E. Wilkinson, R. Tatham and J. Taft, W. Jennings and J. Whitaker.

Spray Producers.—E. A. Brydges (com.)

Springs.—H. L. Wilson and J. Clegg, J. A. Timmis.

Stamps (Revenue), &c.—A. Ungerer, C. D. Abel (com.)

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Steam and other Boilers, Cleaning and Preventing Incrustation of Boilers, Water Feeding Apparatus for Boilers.—F. C. Glaser (com.), F. C. Simpson and J. B. Dennison, J. A. and J. Hopkinson, J. C. Etchells, W. Payton and A. Wilson, G. Temple, J. Parker, E. H. Bennet, W. Thorburn, W. R. Lake (com.), E. A. Brydges (com.), A. M. Clark (com.)

Steam Engines (Stationary, Locomotive, and Marine).—H. P. Holt and F. W. Crossley, T. Hunt, F. C. Simpson and J. B. Denison, H. H. Lake (com.), W. Payton and A. Wilson, W. R. Lake (com.), H. A. Bonneville (com.), W. P. Thompson (com.), A. J. Stevens, R. Wilson, W. W. Girdwood, R. Sutcliffe.

Steam Traps—W. J. Sutcliffe and R. C. Ferguson, J. Conlong and J. Robertshaw.

Stone, &c.—T. O. Jones.

Sugar and Syrups, Glucose.—F. A. Bonnefin.

Surgery, &c.—F. R. von Wreden, J. H. de Bussy, H. Hides.

Syringes, &c.—E. A. Brydges (com.)

Telegraphs; Telegraph Printing Apparatus.—G. Barker, A. E. Gilbert, A. F. St. George, W. Clark (com.), J. G. Drosti.

Tilling and Cultivating, &c. — G. R. Postlethwaite.

Tobacco and Snuff, Cigars, Cigar-Holders, Pipe and Cigar-lighters, Smoking Pipes, Tobacco Pouches, &c.—F. Cooper, W. R. Lake (com.), G. F. Redfern (com.), L. Wahltich, E. P. Alexander (com.), H. J. Haddan (com.), C. E. Cherry.

Tramways and Tramway Carriages, Tramway, Locomotives.—W. T. Ganson, H. Ciotti, R. J. Hinton and G. W. Yockney, J. Holden.

Umbrellas, Parasols, &c.—J Keet.

Upholstery.—H. Lazarus.

Valves, Taps, Stop Cocks, Plugs; Regulating the Flow and Pressure of Fluids.—A. Sweet, J. Day, J. Haworth, A. C Cochrane, J. C. Etchells, W. Morgan-Brown (com.), W. R. Philipson, T. Singleton, A. J. Stevens, J. Woodward, B R. Philipson, S. Mason, W. M. Girdwood, E. Ludlow.

Washing, Cleansing, and Wringing Fabrics, Yarns, and Materials.—J. Conlong and J. Robertshaw, W. Clark (com.), H. L. Wilson and J. Clegg.

Weaving, Braiding, Plaiting, Preparing for Weaving.—J. Waugh (com.), T. Singleton, G. Clayton, J. Holding and E. K. Dutton, R. Hindle and G. Greenwood, J. Bywater, C. Bedford and T. Kershaw, T. Spivey, W. R. Lake (com.), S. D. Rhodes.

Weighing, &c.—J. Hines.

Wheel for Carriages, &c —T. Humber, J. R. Marriott and F. Cooper, J. W. Morgan, F. J. Jones.

Window Blinds and Sashes.—C. M. White (com.)

Windows.—H. W. Periers, W. A. Barlow (com.), W. R. Lake (com.), H. Brittain, C. M. White (com.), W. Lea, A.M. Clark (com.)

Wire, Wire Working, &c.—C. Gaunt, H. A. Bonneville (com.), G. and E. Ashworth.

Yeast, &c.—J. E. Newby and J. F. Ramsay.

Zinc, &c.— A. M. Clark (com.)

⁂ *The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.*

Messrs. William Cornwall, sen., William Cornwall, jun., and Aaron Cornwall, of Louisville, Ky., have recently patented an improved machine for mixing materials suitable for making soap, also for mixing other plastic or pulverulent materials for other purposes. The improvement consists in the construction and arrangement of the rotating arms employed for creating currents, which move in opposite directions, but in different parts of the materials placed in the mixing vessel or receptacle.

Reviews.

MESSER ON BRITISH WILD FLOWERS.

A New and Easy Method of Studying British Wild Flowers, by Natural Analysis. Being a complete Series of Illustrations of their Natural Orders and Genera, analytically arranged. By FREDERICK A. MESSER. London: David Bogue, 3, St. Martin's Place, Trafalgar Square, W.C. 1880.

THIS work is of a character seldom met with, for it is most elaborate, and withal highly instructive; in fact it smooths the student's path to an extent that no one would imagine could be done who does not see the book itself. In the Introduction the nature of the work is fully explained, and an ample Glossary sets forth in detail the various matters described, symbolical illustrations and abbreviations following this. Also a list of natural orders; then follows the analyses of classes, of divisions, of orders, and of genera; to which is added a chart of species, a catalogue of British plants, an index of the orders and genera, and of English names.

It is impossible for us to do anything for this work in the way of quotation, and as the price is not very considerable, we can only recommend our readers to get the work and make use of it, and they will find that no words of praise of ours could be more than the mere utterances of just judgment. The main feature of this very useful work is, however, the adoption of what Mr. Messer terms Symbólical Illustrations, which are nothing more nor less than delineations of the leaves, styles, stamens, and such like arranged in tabulated form, on one page, with explanatory notes on the opposite page, both being arranged as to order, class, and so forth.

THE SMITHSONIAN INSTITUTION.

"Annual Report of the Board of Regents of the Smithsonian Institution." Washington: Government Printing Office. 1879.

THIS Annual Report of the Smithsonian Institute is one of great interest, so great indeed that it would be difficult to name any former report which could outvie it. But we had scarcely needed to have stated this much if we had said that it contains biographical memoirs of Profs. Joseph Henry and Louis Agassiz. Condorcet is likewise the subject of a biographical treatise. Amongst other matters worthy of notice are the Report of the Secretary; Appendix to the Report; Journal of Proceedings, &c.; Henry and the Telegraph, by William B. Taylor; The Effect of Irritation of a Polarised Nerve; Researches upon Fever, by H C. Wood.

HINE MOA, THE MAORI MAIDEN.

By JOSEPH EARL OLIVANT, Author of "A Breeze from the Great Salt Lake," and Translator of "The Court of Mexico," by Countess Paula Kollonitz. A.R. Mowbray & Co. London: 65, Farringdon Street, E.C. Oxford: 116, S. Aldate's Street.

THIS is a pleasant little volume, a good notion of which may be gathered from the following prefatory remarks:—

"A few words as to the origin of the following tale may be permitted.

"I have always been much interested in New Zealand from childhood, when the even tenor of life in a village bordering on the fen districts was pleasantly disturbed by the war-whoops, songs, and dances of a Pakeha Maori. The performance took place in the village schoolroom, and is the first public entertainment within my memory.

"My friend, who called himself Pa-he-Rangi, did not let much light in upon his personal history, only telling us that he was taken prisoner, forcibly tattooed, became of great importance, and finally married, amidst the cheers of the tribe, his chief's daughter. He remained obstinately silent as to the whereabouts of the dark Mrs. Pa-he-Rangi, and Mrs. P. the second assisted his performance by an occasional jingle on the musical glasses. He was, if my memory fail not, a Scotchman, and probably commenced his career as a fugitive from some ship.

"At any rate, his finely tattooed face, his flax mats, his wild songs and dances, his spear with a tuft of flowing flax as an ornament beneath its point, his weapons in general, and especially his tomahawk, into one end of which, by removing the spike, he ingeniously stuffed tobacco, and puffed the smoke through the stem: these curiosities, and, above all, his stamping of a savage war dance with wild gesticulations, were calculated to impress children very much; and for some time after this some of us smeared our faces, tied door-mats round our persons, stuck cock feathers in our hair, and, making spears which we decorated with tow, and imitation-tomahawks, stalked about as Maori chiefs in the kitchen garden, to our great satisfaction.

"It was a terrible blow when at school some years later, to find the celebrated New Zealand chief living in a small house near the station digging potatoes in his garden instead of brandishing a spear, and to meet him in the streets dressed in the unromantic garb of England, instead of in woven flax with war paint on his face. There was in fact nothing left for the fond imagination, except to wonder if Mrs. P. No. 2 still jingled together the glasses in order to relieve for him the monotony of civilised life, and whether No. 1 still pined for the deserter. Perhaps it was she who composed the Maori lament, beginning:

'My regret is not to be expressed,
Tears like a spring gush from my eyes,
I wonder whatever Te Kaiuku is doing,
He who deserted me, &c, &c.'

"Peace be with her! she is not without a sympathiser, for the memory of Pa-he-Rangi in his full beauty of tattoo on the Sunday-School boards, abides yet green in my affections

"Again: the tale of Missionary work in the Pacific: the 'Night of Toil:' 'Polynesian Researches:' the stories of cannibalism, whalers, and general adventure, were well calculated to inspire the young with a vague fascination, as in fact was the whole history of New Zealand from the year 1769, when Captain Cook took possession of the islands in the name of George III.

"Further· the names of Te Heu Heu, Heke, and William King, the episodes at Kororareka, Ohaihau, and Ohoawai; the Wanganui and Waikato wars; the creation of a Maori king; and finally the exploits of Te Kooti, were quite sufficient to add to the interest excited by Pa-he-Rangi, and accordingly an opportunity that occurred later of passing a few months in New Zealand was hailed by the writer with much satisfaction.

"The native legend of Hine Moa—a slight tale in the original, but popular among the Maoris—has been adopted as a vehicle by which to record the impressions received and observations made on the occasion of my visit, and as a peg upon which to hang a picture, however indifferent, of Maori life and customs, before they pass away for ever. The original sketch was written at Auckland a few years ago, and filled up since at leisure moments. My intention has been to write as simple a tale as possible in simple language, and using the simplest images, putting it into the mouth of an aged Maori. At the same time this last endeavour has much increased the difficulty, the possibility being thus destroyed of using a host of European images. Moreover the paucity of the Fauna, as compared with that of other lands—the class of indigenous quadrupeds for instance being blank—is a great loss to a writer where illustration is necessary. Add to this the difficulty of imagining what modes of thought Maoris would employ, more especially under the delicate circumstances of love-making. As to the illustrations, I have tried to use none or few that are palpably false, or that a Maori may not be acquainted with, or have heard of, owing to his intercourse with Europeans; such as those drawn from the habits of bees or deer.

"Two institutions of the Maoris have been omitted in text, which ought perhaps to have been touched upon, namely those of Muru and Utu; but as 'the Pakeha Maori' has not long since republished his work, *Auspice Duce*—no! an Earl, his pages may be referred to, to complete somewhat an imperfect picture, and some mention of them will be found in Appendix F. My scattered notes I have thrown principally into the form of articles, as being more compact in this shape; easier for reference; and forming thus with the Poem a more united whole. Three of these appeared in the columns of 'The Field,' and are reprinted by kind permission of the Editor. Frequent reference has been made to Thompson's 'Story of New Zealand,' and other sources, in the hope of presenting a fairly accurate picture. A line or two here and there in the songs is adapted from native originals.

"The reader is requested for his own convenience to cast his eye over the Appendices before reading the Poem."

FREE TRADE AND TRADE UNIONISM.

"Free Trade and Trade Unionism. By a SHIPOWNER." W J. Potts & Co., Printers and Publishers, North Shields. 1880.

ALTHOUGH we usually abstain from mixing up with subjects of political or socio-political character, yet as the pamphlet before us treats of questions which are at the present day of momentous import, we deem it desirable to bring it under the notice of our readers; especially as we hold to the notion that, however well established any principle in any department of knowledge may be, it ought to be allowed to be questioned by those who have some understandable arguments to advance against it—and we feel the more disposed to open our columns occasionally to adversaries of accepted theories as we know there is scarcely any reliable organ of public opinion that will take any notice of their arguments. Notwithstanding therefore that it is now almost heresy to dispute the value of free trade; yet, finding as we do, that the author of this little work puts forth some observations worthy of consideration, we now bring same under the notice of our readers, and in doing so we deem it desirable to place before them his introductory statement, that owing to the insulated position of this country, all its international trade must of necessity pass through the hands of the shipowner. As a rule, he is better paid for carrying imports than exports, and so cannot be influenced by class interests when advocating a policy that would result in an increase of home-grown food. The following remarks on our Free Trade policy, therefore, may be accepted as unbiassed, whatever their other merits may be.

As regards that portion of the work which refers to Trades Unionism, we must remark that whatever may be the evils that may happen to be mixed up therewith, they have to our mind nothing whatever to do with Free Trade; unless, indeed, the effect of Free Trade be that by the operation of very severe competition wages must be forced down to starvation point, which would of course be to trades unions a *casus belli*. Indeed, Trades Unionism may more easily be squared with protection than free trade, as the author alleges to be the case by his statement (p. 5) that the rules and practices of Trades Unionism "are nothing if not intensified protectionism."

The postulates of our author are these :—

1st. All the food we import must be paid for. A nation can no more avoid this condition, than an individual can obtain food and clothing without paying for them.

2nd. England could not only exist, but continue prosperous for all time, even though she did not grow a tithe of her consumption, so long as she paid for her supplies by her labour, exported minerals or manufactures of equal value to her imports.

3rd. The balance of 142 millions [of imports as against exports] is an annual and irrecoverable loss, the importance of which may be best seen by considering that a relatively small increase of taxation of four millions may at times be sufficient to oust a Government.

4th. Money taken from the people by taxation, sent down to our dockyards and arsenals, and circulated back into the community through the workmen, is not so injurious to the nation as money or values taken from it and sent abroad, never to return.

5th Nearly all classes are supported by working to supply the artificial wants of their neighbours; so no class interest can be injured without affecting prejudicially the whole nation, as its destruction removes a circle of purchasers.

6th. Free Trade as now practised by England has injured instead of assisting us. Free Trade, by an unfortunate coincidence, has received credit not its due, and this mistake, like an "*Ignis fatuus*," is leading us to ruin.

7th. Free Trade has not cheapened food, nor prevented the effect of bad harvests.

8th, 9th, and 10th refer to the circulation of money, and to remarks in furtherance of those already mentioned. The 11th is the one as to Trades Unionism, which has evidently originated in misconceptions of facts, and the adoption of some fallacies. Free Trade and Trades Unionism (says "Shipowner"), although at first sight appearing remote as the Poles, are yet so intimately connected that one cannot be thoroughly considered without the other. This is the result of England's inability to grow sufficient for her own consumption. The surplus must be paid for. To pay for it by our manufactures we must produce them cheaper than the foreigner. This will be impossible if the efforts of labour are artificially restrained and its value increased by arbitrary measures which force it above what the law of supply and demand would give. It is necessary before proceeding further (we still quote) to understand who are consumers, because the interests of the consuming classes are put forward on every occasion by Free Traders as a plea for their views. Let these Free Traders show that the nation, or even the great majority of it, is composed of people with greater interests as consumers than as producers. If they can prove this, they prove their whole case, as certainly it would be unjust to follow a course that would injure the people of this country in the interests of a few producers. The whole contention centres itself here. If it can be shown that the nation is *not* divided into a majority of consumers on the one side and a few consumers on the other, the greatest stumbling-block to a consideration of the effects of Free Trade will be removed. Let us try and find a person that is a consumer and not a producer as well. Nay, go a little farther and try to discover one who is not overwhelmingly more interested in this nation's commercial affairs as a producer than as a consumer. Is he to be found among weekly workmen, or in the salaried classes? Are we to find a specimen among Government employes, or among those who live on interest, Government securities, or railway dividends? It is impossible to enumerate the whole, but take at once the most extreme case possible. Search among pauper children to find one interested less as a producer than as a consumer. Does not the very existence of every one depend on the manufactures, agriculture, and trade of this country? Every imaginable salary, wage, or pension, would disappear if you destroyed these three. Are not revenue and taxes derived from them? Could Government pay salaries and dividends if there were no revenue,—and is it not of vital importance to the pauper child that he should have a prosperous community to come to and work in? We think that no one will dispute that "How to get a living?" is a far more important question than "How to save 5 per cent. on our purchases?"

He proceeds to combat the assertion that freedom of trade must of necessity be correct, seeing that it gives liberty of action, allowing every one to buy and sell in the cheapest and best market.

There can be no doubt as to the advantage of Free Trade in principle; it is in its practical application that a difference of opinion exists It is not a question of what would be best under certain conditions that do not exist, but one of what is most profitable under the present order of things. Had Free Trade been adopted by all other countries, and so given us the true freedom of commerce that is implied in the term of "Free Trade," there would possibly not have been a dissentient voice in this country, notwithstanding that it would have materially injured some important interests. We believe in the principles of honesty and confidence, and desire the universal extension of them; but it is not therefore inconsistent with this belief, that while the world is being reformed we bolt our doors and act with reserve, except to those we can trust, and who fully reciprocate our confidence And so it is with Free Trade We must take a practical view of it, and not a merely sentimental one. Now, it professes to give freedom to trade, but what freedom has it given us? It has given us greater liberty for buying abroad without extending our opportunities for selling abroad, and at the same time it has partially closed our home market against our own goods—as in the case of refined sugar for instance. If we are producers more than consumers, Free Trade must be to us a misnomer. Let us see what a common sense business man would do if such a form of trade were proposed to him for adoption.

His shop is in a good business neighbourhood, but provisions, and other household requirements, are five per cent. dearer than at a short distance where rents are cheaper. Notwithstanding this, he buys in his own neighbourhood,—and why? Because he knows that unless he buys from his neighbours they will remove their custom from him, and because he recognises that a matter of five per cent. extra on his own household expenditure is as nothing compared with loss of trade. And why would other shopkeepers remove their custom? Because they know the purchases of the tradesmen in the neighbourhood form a considerable item in each man's account. But, say some, this is not a parallel case :—the removal of the neighbours' custom would not be a necessity of trade, but a result of pique. Whether the motive in removing custom be retaliation or not, the result is the same, viz.,—a fostering of the trade of a neighbourhood to the benefit of all. And, in fact, the very dissatisfaction would often arise not so much from anger as from a desire to check an offence against the first and best recognised principle of commerce, viz., fostering a business connection. How often do you hear it said of a successful man—"He had a good connection, and skilfully kept it together." Our Free Trade is contrary to the recognised principles of all other relations, as it tells you to disregard your market or trade connection in making your purchases, and to buy even from those who refuse to purchase from you, if their goods are in the least the cheaper, and that even although the difference may be so slight that in all the more important articles of consumption it is almost inappreciable to the customer when retailed out. Our Free Trade blinds itself to the fact that by this refusal to purchase within your own connection or home market, you impoverish it, and thus contract your opportunities of selling, without any compensating opening abroad. As a nation, we should carry out the individual practice of buying from those who will trade with us upon well regulated tariffs, giving preference to our own countrymen, and to those foreigners who will accept our goods on a reciprocity of Free Trade principles.

We have now given some prominent points in this work, and as space will not allow of our making further quotations, we must leave all interested to refer to it themselves.

RECENT AMERICAN AND FOREIGN INVENTIONS.

Mr. William R. Phillips, of Milford, Del, has patented an improvement in fruit driers, which consists in combining with slotted walls slides, cleats, and movable cross bars.

Mr. Gerhart Rauman, of Middletown, Conn., has patented a spring closer for doors, gates, and blinds, so constructed that it will close a door, gate, or blind however much or little may be opened.

Mr. Edward P. Haff, of New York city, has patented a double crochet needle formed of a tube into each end of which a crochet needle is inserted These needles may be fine or coarse, and may be replaced by others when desired, and are inverted in the tube when not in use.

Mr John McAnespey, of Philadelphia, Pa., has patented an improvement in ice cream beaters, which consists in a novel construction and combination of a vertical barred beater and an automatic scraper for removing the ice cream from the interior surface of the can.

Mr. Emil P. Raether, of New York city, has patented an improved bottle stopper especially adapted to bottles containing syrups, bitters, and other fluids used in restaurants.

An apparatus for filling casks and bottles with lager beer or other liquor impregnated with air or gas under pressure, so constructed that the pressure may be regulated as desired and without wasting the liquid, has been patented by Mr. J. C. G. Hüpfel, of New York city.

A simple and efficient apparatus for extinguishing fires has been patented by Mr. Lewis A. Folsom, of Dalton, Ga. The invention consists of two barrels or other vessels, set one within the other, the outer one containing sulphuric or other acid, and the inner one carbonate of soda or other alkaline carbonate, and into the latter vessel a third vessel, containing gunpowder or other explosive, is introduced, the explosive vessel having a fuse or tube filled with powder connected with it and extending upward through the cover of the other vessels, so that fire applied to the tube or fuse will be communicated to the explosive in the interior vessel, and cause an explosion which will burst asunder the containing vessels, and thereby cause their contents to mingle, generating a sufficient volume of carbonic acid gas to extinguish the fire.

Mr. Gennaro Rossi, of New York, has patented a paint composition for woodwork, walls, and the bottoms of vessels, to produce a waterproof surface, and on vessels to prevent the adherence of barnacles and grass.

Mr. William L Gerard, of Junction city, Kan., has patented an improved tether, which permits of keeping the animals within a limited space without requiring a long rope or strap or strong and insurmountable fences. The invention consists in an anchor or like device attached to the halter strap of the animal, so that if the animal steps over the low fence surrounding its pasture, the anchor catches on the top wire of the fence, thus holding the animal

An improved holder for tape, braid, &c., has been patented by Mr. Edward P. Haff, of New York city. It is formed of a U-shaped spring clamp, with a double slitted cross piece and roughened or serrated shanks adapted to clasp the sides of the material.

Messrs. Jules and Charles Schmerber, of Paterson, N. J., and Jules A. Arrault, of New York city, have patented a machine for grinding and mixing plastic compositions or substances, such as pyroxyline compounds or other of which the solvents or part of the ingredients, being volatile, require working in closed apparatus to prevent loss of the volatile portions. The inventors make use of a hollow cylinder for receiving the plastic material, formed with a steam jacket and fitted with a piston that is to be reciprocated by suitable power, and the cylinder is connected by passages at its opposite ends with the grinding machine, so that by the movement of the piston the material is forced back and forth, through the grinder, until the operation of mixing and grinding is completed.

Mr. Mark L. Mount, of Pearsall's, N.Y. has patented an improved matched hook made of two parts, one of which carries a square stemmed pivoted button and locking springs, the other part being slotted to pass the head of the button.

A simple and convenient machine for cutting potatoes and other vegetables into uniform slices and strips has been patented by Mr Jessup Whitehead, of Leadville, Col.

An improved adjustable attachment for carriages, which furnishes a good support for baggage, has been patented by Emma J. Osborne, of Anderson Court House, S. C. The invention consists in a frame or platform pivoted at its outer end between two arms, the inner ends of which are pivoted between two arms connected by a transverse rod and having the upper ends curved so as to form hooks, by means of which they are hooked on to the spring bar of the vehicle.

Mr. Daniel F. Hallahan, of Philadelphia, Pa., has patented a machine for trimming and burnishing the edges of soles of boots and shoes. It consists of two spiders of equal diameters and having an equal number of arms that are fixed upon a shank or shaft between two circular discs or guides, which guides are of slightly greater diameters than the spiders, together with the cutters or burnishers that the spiders carry on the ends of their arms; and it further consists of tangential cutters or burnishers (the cutters and burnishers being interchangeable) adjustably fixed on the ends of the spider arms by means of screws that pass through slots in said arms, the spiders being so arranged that the cutters or burnishers on the one fit into or opposite the interspaces between the cutters or burnishers upon the other, and so that while one of the spiders remains fixed the other may be approached or withdrawn from it, whereby the device may be adjusted and applied to soles of any thickness.

An improvement in extension settee tables has been patented by Mr. Morgan Gossett, of Russellville Ohio. The invention consists of a table having stationary legs and a movable leg and a pivoted extension top that can be horizontally or vertically adjusted, as may be desired, by a novel arrangement of devices, while between the legs seats are arranged.

A car for transporting live stock by railway has been patented by Mr. Francis Rieber, of Callicoon Depot, N. Y. It consists in novel details of construction and arrangement of stalls, feed racks, water troughs, hay lofts, and water tanks, and devices connected therewith, weereby provision is made for securing the comfort and preserving the health of the animals occupying the car.

Messrs. Jacob A. Swinehart and Lafayette Jourdan, of Rushville, Ohio, have patented an improved drag sawing machine, which consists of a beam or bench supported at the rear by legs and in front by a guide block, which rests on the log to be cut. Two levers are pivoted in and extended downward through mortices in the beam, and are connected at the lower ends by a pitman, and to the forward one of these levers is pivoted the saw shank, the saw extending forward and through a cut in the guide block.

The curative properties of an electric current may be adapted to the treatment of different diseases by taking advantage of its different qualities as developed under varying conditions. The current may have great intensity and little quantity, or it may have great quantity and little intensity It may be continuous or intermittent, or it may be made to alternate, so that electrical impulses of different name will rapidly succeed each other. There are two methods of generating electrical currents for curative purposes—one by chemical means, as in the various forms of battery, the other by the direct conversion of mechanical energy into electrical energy, as in the magneto-electric machine. Magneto-electric machines have not generally been considéred as efficient for curative purposes as batteries, on account of the difficulty experienced in constructing a machine capable of yielding the different qualities of current required for the treatment of different subjects. Mr Thomas W. Livingston, of Ainsworth, Iowa, has invented a magneto-electric machine capable of yielding currents varying in their character, so that its range of application will be wider than that of batteries, while it is more compact, more manageable, more easily adjusted, and operated by either skilled or unskilled persons.

Mr. Joseph W. Putnam, of New Orleans, La., has patented an improvement in the class of pile drivers in which the hammer guides or leaders are hinged to permit their inclination, for the purpose of driving piles at various angles.

Messrs. Martin E. Morningstar and John W. Roberts, of Arkona, Ontario, Canada, have patented an improved car coupling of the class called self-couplers; and the improvement consists in the peculiar construction of the link holder.

Mr. Peter Josserand, of Hockley, Texas, has patented an improved valve gear for engines, which consists of a lever, a shaft, and two friction wheels of different diameters for receiving motion from the crank shaft and transferring the motion at an increased velocity to the valve shaft

Mr. Hans Knudson, of De Forest, Wis., has patented a dynamometrical engine governor, by means of which the work performed by the engine and the strain upon the driving wheel regulates and controls the steam supply

Mr. Tiry S. Pylant, of Ridge Spring, S.C., has patented improvements in turbine water wheels of that form in which a horizontal wheel is enclosed by a case having upon the top oppositely opening trunks or conduits for delivering the water to the wheel, which trunks have flaring mouths and taper downwardly into the plane of the wheel.

An improvement in well-boring apparatus has been patented by Mr Harry Samuel Gail, of Waukegan, Ill. The object of the invention is to provide means for holding the auger to the rotary shaft in such a manner that they may be really disconnected to allow of the withdrawal of the auger without disturbing the shaft.

An improved railroad rail, intended to prevent the noise produced by its vibrations, has been patented by Messrs. Henry V. Piaget, of Jersey city, N. J., and Frederick A. Piaget, of New York city. The invention consists in applying a thick layer of cement or like material to the sides and bottoms of the rails, and fastening strips of wood to the sides and bottoms of the rails by means of the cement, thereby preventing the emission of sound, by the vibrations of the rails.

Mr. John L. Taylor, of Las Vegas, Territory of New Mexico, has patented a telegraph pole that is more durable and lighter than ordinary poles, while having the requisite strength.

Mr. Nicholas Boren, jun., of Haubstadt, Ind., has patented a novel arrangement of a churn dasher rod and a series of shafts and band wheels, and a drum and weight, whereby provision is made for obtaining a rapid movement of the dasher.

The combination, with a map, of index sheets secured by their upper edges to the map roller and pendent on the side of the may, has been patented by Mr. Orson S. Haskell, of Evanston, Ill.

An improved car coupling has been patented by Mr. Jesse T. Rice, of Grand Rapids, Mich. The invention consists of a novel combination of devices, which cannot be clearly described without engravings

Mr Abraham F. Denliger, of Jamton, O., has patented an improved gate, so constructed that it can be opened and closed by the wheels of a passing vehicle. It is simple in construction and not liable to get out of order.

A light, strong, and durable fence, which is easily set up, taken down, and moved from place to place, and is inexpensive in manufacture, has been patented by Mr. Henry E. McWhorter, of Blooming Grove, Ind.

Compressing Fluid Steel.—A proposal has been lately made in some quarters to effect the compression of fluid steel by placing in the ingot mould on the top of the fluid metal a charge of nitrate of soda or other solid which evolves gas on being heated, the top of the ingot mould being then closed, and the pressure due to the gas generated being allowed to act on the fluid steel. With reference to this proposal it may be worth while to record that this mode of operating was proposed—and we believe patented—by M. Antoine Galy Cazalet, of Paris, some thirteen years ago. M Galy-Cazalet proposed to use a mixture of 80 parts of nitrate of soda with 20 parts of charcoal, the mixture being introduced through a cock fitted to a cap affixed to the head of the ingot mould. With a space of 30 cubic inches capacity between the fluid metal and the ingot mould cap, the introduction of ¼ oz. of the mixture is stated to give a pressure equal to that of a head of metal 90 ft. high. We do not know whether this mode of operating was ever regularly applied in practice; but if it was it would be interesting to know the results.

Trade Marks (Switzerland).—We have received the following notification from the Trade Marks Registry Office.—"A despatch has been received through the Foreign Office from Her Majesty's Minister at Berne, containing copies of the trade marks deposited at the Federal Bureau between the 1st of May and the 31st of July last for subsequent registration in Switzerland. It is very important that persons using trade marks in Switzerland should inspect the official publication containing a transcript of the trade marks applied for, as the period for lodging objections to the registration of these marks terminates on the 30th of the present month The publication can be seen at the Trade Marks Registry Office, 25, Southampton buildings, Chancery-lane, between the hours of 10 and 4."

The Scientific Review

AND

SCIENTIFIC AND LITERARY REVIEW,

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President, SIR ANTONIO BRADY.

THE SESSION 1879—1880

IS ENDED.

The Balance Sheet 1879-80 can now be inspected.

Subscriptions are payable to Mr. G. A. STRETTON, the Receivor, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

Proceedings of the Institute.

The Institute being out of Session, there is no business to report.

The new Session of the Institute will begin early in November. It is proposed to commence the Session with a Dinner, as in some former years. Those members who may wish to attend it will greatly oblige by communicating with the Secretary without delay.

Monthly Notices.

The Electric Light.—The Museum of Practical Geology will, it is reported, be illuminated by electricity, same to be introduced immediately after the recess.

The Indian Government have taken energetic steps to institute tidal observations at some of their principal ports, and the results will be published in the form of tide-tables. The observations are reduced by Mr. E. Roberts, of the *Nautical Almanac* Office, by the system of harmonic analysis, which has been adopted for the reductions carried out under the auspices of the British Association The number of ports for which tables for 1881 will be forthcoming is seven, viz., Aden, Kurrachee, Bombay, Carwar, Beypore, Paumben, and Vizagapatam. We understand that some preliminary tables have been already checked on the spot in India, and have been found to be remarkably accurate. The number of ports will be increased to about twelve in 1882, and eventually to twenty-two, the full number for which it is contemplated to issue tide-tables. It is very gratifying to find the Indian Government taking such useful measures on behalf of shipping interests and navigators in general, and we hope it may serve as a stimulus to our own Admiralty, which might, perhaps, with advantage display more enterprise in its hydrographical labours.

Coal of a peculiar character M. A. Inostranjeff, in the *Neues Jahrbuch für Mineralogie*, describes as found near Lake Onega in Russia. It is much richer in carbon than ordinary anthracite, containing, when free from water, 98·11 per cent. The pure varieties show a strong metallic lustre, which is not destroyed by a dull red heat Its hardness varies from 3·5 to 4, and its density at 4° C. is 1·841. Analysis gives carbon 95·50, hydrogen 0·40, nitrogen 0·41, water, and ash.—*Athenæum.*

The Rev. Arthur Rigg.—We regret to announce the death of the Rev. Arthur Rigg, M.A., which occurred at his residence, Warrington Crescent, on the 2nd September. At a time when the scientific education of engineers was almost unknown in England, Mr. Rigg had established workshops as far back as 1844 in the College at Chester, where he was Principal for thirty years. Here, during the interval between theoretical studies, the students carried on various handicrafts, carving both the stone and wood work for their beautiful chapel, and subsequently making tools, lathes, and steam engines, &c., and many engineers received their early training under his auspices. He read a paper on "Mechanism" before the Society of Arts in 1872, and gave a most original series of lectures on "The Tools and Contrivances used in Handicrafts," in 1875. As a member of the Royal Institution and kindred societies, he regularly watched the general scientific progress of the age, and to the very last took a keen interest in all engineering pursuits.

Cause of the Acid Reaction of Animal Tissues after Death.—Mario Ekunina says that the acid reaction is due to a decomposition of the fluids in the tissues effected immediately after death by the action of Schizomycetes. At first volatile fatty acids appear derived from the incipient decomposition of the albumen, speedily followed by the two lactic acids produced from glycogen. The richer a tissue in carbohydrates, the longer this acid reaction prevails after death, as in the liver, the muscles, and the lungs. It is briefest and faintest in the pancreas. In the later hours of putrefaction, the lactic acids disappear and are succeeded by succinic acid. Sooner or later an alkaline reaction sets in throughout the tissues, much ammonia being evolved from the decomposition of the albumen.

Purification and Refining of Fatty Matters.—To recognise if an oil is pure M. Octave Allaire takes a piece of carbonate of soda (crystal), the size of a nut, dissolves it in its own bulk of water, and shakes it up with the oil under examination in a bottle. If the oil becomes turbid, and gives on settling a solid bulky deposit, it has been badly purified. Oils which act upon the metal of lamps and form deposits of verdigris are also to be rejected as impure. Commercial samples often contain 10 to 15 per cent. of free oleic acid.

THE

Scientific and Literary Review

OCTOBER, 1880.

SANITARY PROGRESS.

SANITARY Science has recently been brought as prominently before the public as it has ever been since the time when men of position and scientific attainments first deemed it wise to give some attention to matters which are of the deepest interest to all of us. The Sanitary Congress, which has just been meeting at Exeter, under the presidency of the Earl Fortescue, who has been supported by Sir Antonio Brady (President of the Inventors' Institute), the veteran Mr. E. Chadwick, Mr. Rawlinson, and others, appears to have done as much good work as has ever been accomplished at any former meeting.

The Exhibition, or Museum, which is to be kept open till 9th October, has proved particularly interesting. It was intended that the awards of a gold and other medals for the best exhibits should have been made, but the judges could not finish their examination in time, and those, therefore, stand over. The first class of exhibits is connected with construction and machinery. The second consists of articles and appliances connected with sewerage and water supply; the third, of appliances connected with heating, lighting, and ventilation. The fourth relates to personal hygiene, foods, and disinfectants. In the first class there are sanitary wall papers and decorative materials. But perhaps the most attractive of the exhi is the ingenious system of warming buildings and rooms by corrugated iron plates is presented by our esteemed friend Mr. G. E. PRITCHETT, F.S.A., &c., of London, who in the same class shows his little instrument for giving an alarm in case of fire. A thermometer so balanced that in case of a rise in temperature the mercury causes the instrument to act so as to ring an electric bell. There are also "forecasting" barometers exhibited by other inventors. The inventions in the second class, for providing houses with properly constructed baths, appliances for water supply, and means of cleanliness, are very numerous, and at a cost suited to the conditions of all classes. In the third class some cheap and ready means of increasing the light of the gas jet without increasing the consumption are shown, and excellent stoves for warming and cooking. The fourth class includes some new drinks of the non-alcoholic character. Dr. Hinckes Bird, late medical officer for Blackpool, gives the public the benefit of his invention for "costless ventilation." Altogether there are some thousands of exhibits, and the public of Exeter and the adjoining towns have shown great interest in the instructive display.

We have not space enough at our disposal to give anything like a general review of the proceedings hence must be content with selecting something noteworthy and instructive, and for this purpose we cannot do better than present our readers with an epitome of the address of Sir Antonio Brady, as President of the Section on Geology and Meteorology, who has entered very actively into the general business of the Congress, presiding at meetings outside his own section and so forth.

Sir ANTONIO BRADY, in the first part of his address, reviewed the history of the earth, as evidenced by geology, and urged that it would be seen that many and vast changes had been and were still being effected by the hand of man, though not always for the better or for his own well-being. In respect to "climatology" the speaker quoted many text-books, and contended that the destruction of trees in the plains of India was the cause of the arid nature of the land. Coming to the subject of the poisoning of the atmosphere in large towns, he said that to obtain the blessings of plenty of pure air, pure water, and wholesome food for the people was the object of sanitary science and sanitary legislation. But modern sanitary legislation had to a great extent failed in its object. It was a notable example of how not to do it, for it placed the power of dealing with and abating nuisances mainly in the hands of those who created them, and it was only in very serious cases, with great difficulty and expense, that public opinion was able to compel local authorities to put the Acts in force. These public authorities seemed to be under no responsibility; they consisted mainly of officers appointed and removable by the large ratepayers, who, some of them being manufacturers carrying on noisome trades and living at a distance, thought more of saving the rates and less of the health or comfort and happiness of the populous neighbourhoods cursed by their unwholesome factories. The whole mischief of noxious vapours being driven off into the atmosphere might be avoided if only the vicious system of permissive legislation were changed, and the law compelled the authorities, however appointed, to put the law in force, and held them personally responsible by fine or imprisonment for neglecting their duty. Especially sanitary inspectors and medical officers of health should be appointed by the State; but, however appointed, they should be protected by it in the performance of their duties. Sir Antonio had the misfortune to live in the far east of London. When he was a young man and first came to live there, more than 40 years ago, the place was a suburban village, and the population of the whole parish was under 10,000. By the improvements in London, and the removal of the dens of St. Giles, the City, Shoreditch, and Whitechapel, the population had been driven east, and West Ham was now a town of more than 120,000 inhabitants, daily increasing. It had also become a new centre of industry, and, by the formation of magnificent docks, a very important part of London. The Metropolitan Board, having regard to the metropolis only, drove the filthy factories of Bow-common over the border into Essex. They took refuge in the adjoining parish, West Ham, where, in the midst of a crowded parish, they carried on their noisome trades with impunity, mainly owing to the protection given to them by the curse of permissive legislation. Animal charcoal makers, artificial manure makers, blood boilers, chemical works, and other kindred trades (if allowed at all to come into populous places) should be compelled to use retorts or other means which science could point out to remedy this state of things. The speaker dealt exhaustively with the subjects of water, sewage and marsh fever, which he held was due to the decomposition of vegetable matters, and he enforced the necessity of a rigid adherence to the laws of health. The Bishop of Exeter, in moving a vote of thanks to Sir Antonio, spoke of the high value which should be placed upon this compendious paper, which had brought before the audience matters with which most of them were unacquainted, and he would specially benefit the nation in calling attention to the causes of climatic changes in India—changes which had affected the well-being of vast populations. Mr. R. Rawlinson, C.B., who seconded the motion, while agreeing with much in the address, said that tree-felling might modify climate, but he could not agree that it would create great features of change. As to the causes of malaria, or marsh fever, he said he had studied the subject in different countries, and had arrived at the conclusion that this evil was caused principally by filthy habits of life. Dr. W. B. Richardson dwelt upon the importance of attention being directed to the cause of momentous changes of climate in parts of India—changes which led to the periodical famines among large populations.

The vote of thanks was then carried and acknowledged.

Proceedings of Societies.

ENTOMOLOGICAL SOCIETY.

SEPT. 1.—H. T. Stainton, Esq., V.P., in the chair.—Miss E. A. Smith, Assistant State Entomologist of Illinois, was elected a foreign member.—Mr. J. J. Weir exhibited specimens of *Odonestis potatoria* and *Smerinthus populi*, which possessed the peculiarities of both sexes.—Sir S. Saunders exhibited six winged examples of the Stylopideus, genus Hylecthrus, and also various other Hymenoptera, and contributed remarks thereon. Miss E. A. Ormerod exhibited some galls found on *Tenacetum vulgaris*, which she described at length. Mr. T. R. Billups exhibited a female specimen of *Polyblastus Whalbergi*, an ichneumon not previously recorded in Britain.—Mr. E Boscher exhibited living specimens of the two varieties of the larvæ of *Smerinthus ocellatus*, and contributed a note thereon.—Mr. Meldola exhibited some specimens of *Camptogramma bilineata*, a large number of which had been found by Mr English near Epping, attached firmly to the leaves of the "tea tree" (*Lycium barbarum*) by the abdomen, in which position they had died, possibly from the effects of fungoid disease — Mr. A. H Swinton communicated a "Note on *Luciola Italica*," an Italian fire-fly.

BRITISH ARCHÆOLOGICAL ASSOCIATION.

THE thirty-seventh annual Congress meeting of the British Archæological Association commenced on Monday, the 16th August, at Devizes, under the presidency of Earl Nelson After the two meetings of immediately preceding years at Wisbech and Yarmouth the Association gladly revisited westerly hunting-grounds. Twenty-two years have elapsed since the Congress of the Association met at Salisbury for the examination of Wiltshire antiquities, and probably very few of those who took part in this Congress were numbered among those who then explored the beauties of Salisbury Cathedral, the Gib Hill tumulus, or the earthworks at Old Sarum. The proceedings were inaugurated by a cordial reception at the Town Hall by the Mayor and Corporation of Devizes and the executive members of the Wiltshire Archæological and Natural History Society, a society which has flourished for many years and collected in the pages of its periodical magazine an immense store of topographical, archæological, and scientific information, by way of pendant to the colossal works on Wiltshire by Sir Henry Colt Hoare.

In the temporary absence of Earl Nelson, whose inaugural address upon the county antiquities selected for examination was postponed to a future opportunity, the Rev. A. G. Smith, of Yatesbury, a prominent member of the Wiltshire Society, cordially welcomed the members, and pointed out with great eloquence the leading features of ancient and mediæval Wiltshire. This county possesses, perhaps in a greater degree than any other in the whole of England, magnificent examples of the earliest works attributed to human agency on the globe. The British period, illustrated but sparingly elsewhere, here is well shown by the flake-strewn, barrow-studded downs; then comes the marvellous and mysterious megalithic edifice at Stonehenge and its larger, but perhaps less generally known companion in age, Avebury; Silbury, the largest artificial mound in Europe, with its adjacent stone circle, the Roman road at Wanshouse; Amesbury and Vespasian's Camp; the castles of Bratton, where the Danes once held their camp, and Devises; the monastic remains at Malmesbury—the home of the most vivid and most trustworthy of our chroniclers, William of Malmesbury—Bradenstoke Priory, and Lacock Abbey; and a large number of typical specimens of ecclesiastical and domestic architecture, all being included in the places put upon the programme for visitation during the eight working days at the disposal of the Association. Under the guidance of the Rev. H. A. Olivier and Mr. Henry Cunnington, Curator of the Devizes Museum, the extensive collection of antiquities recovered from excavations in the barrows preserved in that institution was inspected, and the party was then conducted to the churches of St. Mary and St. John, which were described at length by the Rev. Dr. Burges, rector of Devizes. Afterwards a visit was made to the remains of the ancient castle, renowned in the middle of the twelfth century in the wars of the Empress Mathildis, daughter of Henry I., who, as Mr. W. de G. Birch pointed out in a paper published some time ago is entitled to her place among the sovereigns of England by reason of her formal recognition by the Government then existing in England during the eventful years 1141-1142.

After visiting some buildivgs in the town, the members assembled in the Town Hall, and the President delivered his inaugural address, in which, after referring generally to the important bearing which these annual gatherings of archæologists had upon the furtherance of the study and the preservation of our historical relics, he proceeded to point out that the Association might assist in promoting archæological lore by preserving the old names of different fields and farms. Every field had a name, and many still retained them by mere tradition among the old labourers and in the old parish maps and terriers. Some of more modern date only referred to the size of the field on its comparatively recent allotment, such as "Hundred Acre," which generally meant "under an acre," and "Ten Furlong," or the like, but there were much older names than these, and if any one ever attempted to walk the bounds of an old Saxon charter many of the old names, if kept, would help out the boundaries, and the specified points on the boundary would give an explanation to the names. For example, Whelpley, Wollow, Landford, were a proof of the British being originally to the east of Christ Church Avon Cerdic's battle at Charford drove the Britons to the other side, and caused the succession of forts from Old Sarum down the valley protecting the western lands to which they retired. A few years ago, in digging in a rabbit burrow, Lord Radnor's keeper came upon the remains of an old Saxon chief, with his sword by his side, who had evidently fallen in the moment of victory in the middle of the fortified pah which he had taken from the British.

On Tuesday, the 17th, at an early hour, a large party was conveyed in carriages to Potterne Church, which, with the ancient porch and church house, was described by the Rev. H. A. Olivier, Mr. E. P. Loftus Brock, F.S.A., and others. From this place the members proceeded to Eastwell, where the font, attributed to the very early date of the tenth century, and its remarkable inscription were inspected. The drive was then continued through Erlestoke to Edington, where the church and the monuments were examined, and a brief description of them given by Mr. J. R. Bramble and other members. After luncheon the church of Tinhead Bratton was visited, and the encampment at Bratton, by some believed to be the site of King Alfred's decisive victory over the Danes, explored, most of the visitors walking up the ascent and inspecting the well-known "White Horse." The return journey to Devizes was made through Steeple Ashton, whereby an opportunity was provided for viewing the church, Keevil with its church and fine examples of ancient timbered houses, and Poulshot Church with its interesting belfry. The long day was yet further extended by the reading of papers by Mr. J. A. Picton, F.S.A., and Dr. Stevens. Wednesday's proceedings consisted of a visit to the church of Bishop's Canning; an inspection of the Wansdyke, about two miles from the church; thence across the Roman road to Avebury, with a description of the megalithic circles by the Rev. A. C. Smith, to whom also the Association stands indebted for the description of the stone circle opposite the great artificial mound at Silbury, to which the party was taken through the celebrated Kennet avenue. On Thursday, Bradenstoke Priory, Dauntsey, and Malmesbury Abbey formed the principal portion of the programme.

SOME RECENT ADVANCES IN AGRICULTURAL CHEMISTRY.

THE above subject is treated in such an able and interesting manner by Professor Church, in his lecture at the Royal Agricultural College, delivered not long since, that we present the same for the perusal of our readers :—

Professor Church, who was loudly applauded on rising, said:—Ladies and gentlemen, my lecture this morning will be a somewhat fragmentary one, and a somewhat brief one, but I thought it might be of interest to you were I to bring before you a few of those recent researches in agricultural chemistry which have attracted my own attention in the last year or two. Let me open by saying a few words on the very beginning of the subject, viz., germination of seeds. It is a matter of great importance to farmers, as well as to horticulturists, to ascertain the germinating power of seeds, and also to learn how far their treatment with various chemical agents will favour germination, destroy germination, or detect those seeds which are not available or actually hurtful to animal nature. Now, first of all, let me mention to you the instrument which has been employed in most recent researches for ascertaining the germinating power of seeds. It consists of an earthenware pan or basin, with channels made for water, and the seeds being placed therein, the plan is to count every day how many seeds have germinated, it being found that from 80 up to 99 per cent. of our agricultural seeds will germinate But there will also be found weed seeds among them, and those will be capable of being picked out. In this way you get a very good notion of the value of the seeds to be experimented upon A former pupil at this college, an Italian, who took his diploma here some few years ago—I allude to Signor Giglioli, now Professor of Chemistry in the Agricultural College, at Portici, near Naples—has lately published a very interesting and important paper not only upon the germinating power of different seeds used in agriculture, but also upon the action of chemical solutions and gases and various liquids upon seeds. Although these researches have been going on for two years, Signor Giglioli is only just beginning to get into the heart of the matter, but I draw your attention to them on account of what he has found with regard to some seeds of low vitality. He finds that if he takes a sample of wheat seed, and grows it in a certain atmosphere, or rather if he treats it with certain gases, carbonic acid gas, oxides of nitrogen, &c., that no advantageous influence results on the germinating power of seeds. It has been stated frequently that these gases will produce an advantageous result, but it is now found that such is not the case. He also finds that many seeds have a marvellous power of resisting the deleterious action of certain gases, solutions, and liquids. Wheat grain will resist the action of a strong solution of blue vitriol, sulphate of copper, which is used to destroy fungi sometimes found on the grain, for a long period. In one case I believe the wheat resisted the action of the vitriol for nearly a year, and at the end of that time it still showed very nearly the same germinating power as the untreated seed did. Hundreds of similar experiments are recorded in these researches. He further finds that many of these seeds aged, or became less full of vital power, after being subjected to the gases or solutions, as they did in the air—that if there were less germinating seed after a few weeks in the treated specimens, it was simply because in the course of a few weeks in the ordinary specimens under ordinary conditions you get fewer seeds germinating. But he found one other fact of some importance Supposing a few seeds of some thin-skinned sorts were mixed with the wheat, you can by the application of certain solutions cause the foreign seeds in the wheat to be killed. You can in fact by certain solutions poison certain seeds without injuring the wheat seeds. On the other hand many solutions will destroy the vitality of the grain, and not affect the thicker coats of other seeds. But you will see how this opens up the possibility of cleaning our seeds by chemical agents before use.—The learned Professor then passed on to draw attention to an important point connected with the green colouring matter of plants. They were aware that it was only a green leaf that could obtain carbonic acid gas, and feed itself from that constituent of the atmosphere, and it was thought that those cells of the plants which contained the leaf green had the sole power of performing that function. But a German experimenter, Pringsheim, last year found that the chlorophyll, or green colouring matter, seemed to act almost exclusively as a screen to prevent the destruction of the substance which really decomposed the carbonic acid gas, that the chlorophyll itself was not capable of performing that office, and that what was called the protoplasm or something contained in it was the real acting agent. Experiments were in process by which it seemed that green colouring matter other than chlorophyll would act as an effective screen to cut off the injurious rays of the sun, and only allow those rays to pass which permitted the protoplasm to decompose the carbonic acid gas.

FOLIAGE TRANSPIRATION.

Professor Church continued: The next research of importance which I have to bring before you is concerned with the transpiration of water from foliage. It has been proved by Messrs. Lawes and Gilbert that each ton per acre of air-dried produce, say each ton of hay from a field, involves the evaporation from the foliage of the grass or miscellaneous herbage which constitutes that hay, of 2½ in. of rain. But they have proved also, and nine or ten other observers have in past years shown that the results are in accordance with fact, that of the water that falls upon the soil in round numbers only 30 per cent. percolates, and 70 per cent. evaporates—that more than two-thirds of the water that falls in rain, dew, and mist on the soil, whether plants are there or not, will evaporate, and that this is largely increased by the presence of grass or any farm crop upon the surface of the land. You see the connection of these two matters. We have in the 70 per cent. of water that falls on the land and that evaporates, not a supply for the use of the hay crop or grass crop, because that portion evaporates independently to a great extent even of the amount that goes through the plant. Only 30 per cent. percolates, and you see this is an important matter in connection with the subject of water supply and drains. What Lawes and Gilbert have found is that according to the depth of the soil, so the amount of evaporation is greater. It is most singular, but the lower you go down you get less water percolating. It is not merely retained by the soil, but it finds its way up through capillary attraction to the surface, and so evaporates. Thus if you put a drain in at 9 in. you would find more percolation than you would at 18 in., and so it goes on diminishing till at a depth of 4 ft. 6 in. there is still a decrease of 1 per cent. in the amount of percolation. Now in connection with this subject, a great many experiments have been made by three or four different foreign experimenters upon the transpiration of foliage. One of our chief authorities has found that with respect to the Jerusalem artichoke one square metre of foliage lost in sunshine 65 grams of water, or more than two ounces of water for every square of 39 inches. In the shade, the same space only lost 8 grams, and at night only 3 grams It has been found by the same authority that many other plants showed a similar difference, proving that the great evaporation of water was in sunshine and with the air in its ordinary condition of moisture. When the air is very dry, the transpiration seems often to diminish instead of to increase, in order thus to prevent the plant becoming desiccated. The same chemist concludes that an acre of beet or mangolds would in twenty-four hours consecutive and uninterrupted sunshine lose between 8,000 and 9,000 kilograms, or 20,000 lb. of water. This will give you an idea of the enormous evaporation from the crop independently of the evaporation from surface or the bare soil One chestnut tree, twenty-five years old, exhaled in twenty-four hours 60 litres, or 13¼ gallons, of water through its foliage. The upper side of the leaf, on an average, exhales one part to 4½ parts exhaled by the under side of the leaf. Now this matter is connected with the absorption and decomposition of carbonic acid gas. When a leaf contain 60 per cent of water—it was the leaf of the lilac that was experimented upon in this instance—it was found that a square metre of leaves containing 60 per cent. of water, or rather less than the average amount, decomposed in one hour sixteen cubic centimetres of carbonic acid gas. This is the most important function in the plant, and it is to a certain extent dependent on the presence of the right amount of moisture in the plant, for when they were allowed to dry, the amount of carbonic acid gas decomposed decreased as the plants got drier, until when the plants contained only 29 per cent. of water they decomposed none at all. And now to speak of the relation between the amount of the water and the ash of the leaves It has been found that the leaves of the common cherry laurel of our hedges in the first year contained 80 per cent. of water; in the second year, though the leaves are not larger, they contain 64 per cent of water, and at that they stop. This is also the case with hundreds of plants experimented upon—they contain more water when in active work, and when the functions cease the water diminishes. Now this is intimately connected with the process which goes on in the plant; it is the migration of the constituents of the plant, which has been recently worked up by two German chemists. Leaves of the lilac gathered on the 15th April contained when dry 28 per cent. of albuminoid matter, 4·4 of ash, and 1·4 of phosphorus pentoxide. Leaves gathered on the 6th June contained 15 per cent. of albuminoid matter, 6·9 of ash, and ·77 phosphorus pent oxide. Leaves gathered on the 1st October contained 11 per cent. of albuminoid matter, 8·2 of ash, and ·46 phosphorus pentoxide. You see how the albuminoid matter diminishes, or at least the nitrogen, for although this is calculated as though all the nitrogen existed in the form of albuminoid substances, it would not be fair to call them all albuminoid matter. You see how the ash increased, and how the leaf became poorer as it grew older from the 15th April, through June, to the 1st October. The phosphoric acid had left the leaves; the ash had increased but was of a poorer quality; the nitrogen had gone to feed the other parts of the plant as well as the phosphoric acid. Some figures were more remarkable still. In the case of maple, on the 1st of May 100 parts of dried maple leaves contained 2·8 of phosphorus pentoxide, and on the 3rd October they contained only ·12 per cent., or less than one-twentieth of that contained on the 1st May. The phosphorus pentoxide had gone to feed the fruit and flowers of the maple, and had left the leaves. Now, not only is there the question of the migration of the constituents, but the nature of them is altered. In the case of the maple, there is 12 per cent. more lime in the old leaves than in the young, and 84 per cent. more silica. While the lime and silica are on the increase, the phosphoric acid and the nitrogen diminish, and recent researches show this very distinctly indeed. Chemists who have investigated this matter, have also worked upon the amount of water in the foliage. In the first year of their growth there was 77 per cent. of water in the cherry laurel, and in the second year 51 per cent. These figures are slightly different from those I gave you from another experimenter, but practically the same conclusion is arrived at, viz., that active growth of the plant demands not only the presence of large quantities of nitrogen and phosphoric pentoxide, but also of a considerable amount of water. The next point to which I will draw your attention is a paper published recently by two young chemists, Messrs. Bevan and Cross, upon fibres. This is connected of course with agriculture, as many of our important plants grown, not in England perhaps, but in Europe and many parts of the world, are cultivated for the sake of fibre used in the manufacture of textiles and papers which they yield. We have had a great difficulty in knowing anything of the chemical constitution of the matters found in fibre, and this paper, read on the 16th April of this year, and published at Manchester, is one of the most important contributions that has been made to this subject. These gentlemen have actually succeeded in getting substances out of fibre which have a definite chemical formula. We have always put down the composition of the fibrous parts of plants as consisting of two substances, cellulose, and a matter which for brevity's sake we call lignose. We did not know a great deal about lignose, but these gentlemen have found that this matter gives some perfectly definite compounds, and is not the vague substance we imagined it to be. The value of the research is that it enables manufacturers in preparing hemp or flax for the market to attack the lignose and remove it, without injuring the integrity of the fibre, and Messrs. Bevan and Cross's description of the method of doing this has brought about its introduction into several manufacturing centres. Thus we are enabled to operate on our fibres with some degree of knowledge, instead of at haphazard.

To proceed, there have of late been some fresh determinations of carbonic acid gas in the air. As you know, but for the plants consuming carbonic acid gas, neither man nor animals could live on the earth. We breathe the oxygen, and maintain our activity and warmth, and feed ourselves from the carbon consuming plants, &c. Therefore the quantity of carbonic acid gas contained in the air is most important to be ascertained. It has been thought four out of 10,000 cubic centimetres of air were carbonic acid gas, but it has now been determined that in pure air 2·942 parts in 10,000 are carbonic acid gas. Taking the air off a field of red clover in full flower the quantity was found to be 2·828, off a field of lucerne 2·829, so that while the open air contained 2·942, the clover or lucerne decomposed by their foliage a portion of the carbonic acid gas, and the amount was lowered. And so with a flock of sheep (not taking their breath), the reverse process would naturally occur, and there the amount of carbonic acid gas was 3·178 parts in 10,000, and near Paris it was 3·027, showing the influence of a large centre of population on the purity of the air. In all the figures the result is lower than the four parts in 10,000.

I had intended to have drawn your attention to some interesting researches lately made upon plants found to flourish upon soils of definite ascertained condition. Several interesting researches have been made lately upon this point, and a classification of the soils according to the natural herbage found upon them is being gradually elaborated. As you may all help in this work by observing what plants in a wild state grew on soils which may be afterwards submitted to analysis, you will see that this is a matter of great interest to everyone Supposing that a soil contains 90 per cent. of sand and 10 per cent. of clay. Well, you will find that only six or seven plants can possibly grow on them. Then suppose that land was altered to contain 20 per cent. less sand, and to have added 20 per cent. of fine clay. The land would then grow most of our cereals and clovers. Tables have been prepared on this subject, and they are of great interest and value, for they tell us what plants, without any considerable amount of artificial manures, are most naturally suited for successful cultivation upon certain soils In the same way with clay soils. With a high percentage of clay only a few plants can be grown, but if you add more sand and less clay you can grow all the plants you want on the farm. Some interesting investigations on the constitution of soils have already been made. For oats and rye it has been found you must have 1½ per cent. of carbonate of lime if you want a remunerative crop; that if there is to be a successful barley crop, there must be in the soil from 2 to 3 per cent. of carbonate of lime; and for the successful growth of first-rate wheat you must have from 4 to 8 per cent. of carbonate of lime, other things being practically the same.

The next point I have put down here is the question of reduced phosphates, and that is rather an important one, and has been worked upon in the present year. It has been found that the reduced phosphates commonly present in superphosphates kept some time can be best determined by treating the washed superphosphate (washed in pure water) with a strong solution of citrate of ammonia. And it is also considered by the experimenters who have studied the question that when you get an advantage in using superphosphates over insoluble phosphates, it depends more upon the state of the soil than upon the increased activity of the dissolved phosphate. If your roots are on sandy or peaty soil, and are only just on the surface of the ground, and their "feeding ground" lies but 2 in. or 3 in below it, when the rain comes it does not wash the superphosphate out of the soil (for experiments prove that it does not occur in drainage water), but it sinks through the soil out of the feeding ground of the plants, and descends to a lower level, where it is not of so much use. But on other soils, where there is plenty of carbonate of lime, there the superphosphate distributes itself in the feeding ground of the plants, and it becomes available for the immediate use of the roots at a critical period of their growth. Therefore it is rather in the condition of the soils that we must learn the different manurial value of these compounds.

I had intended to have drawn your attention to another matter, but I can only name it without giving you any details on it. You know that in the last five or six years a great deal of attention has been paid to the nitrogen in food stuffs; that, in fact, it has been found that nearly all the old analysis of grasses and clovers and roots are utterly and entirely wrong. They are wrong only in one particular, but in one of the most important of all. Chemists knew it was not quite right, but they did not know how much it was wrong, and they thought the error was only a small one. It has been the custom of agricultural chemists to ascertain the amount of nitrogen present, and multiply it by 6·33 to arrive at the amount of albuminoids. or flesh formers. It has been taken for granted that all the nitrogen was really present in the form of albuminoid material. But the real fact was that some foods contained a half or three-quarters of their nitrogen in forms not of the slightest value as albuminoids. I will give you an exceptional case as an illustration. Lettuce will burn away readily to ashes because of the presence of saltpetre. But though saltpetre contains nitrogen it is of no use as food. If you analyse lettuce and multiply the nitrogen by 6·33 to get the albuminoids, the result is 6 or 8 per cent. flesh formers, the real amount being about 1 per cent. In beans and mangolds 1½ per cent. flesh formers have been considered as present, indeed as much as 1·818 per cent. has been found by the ordinary method of multiplying the total nitrogen by 6·33. But when determined by four other methods, all of which are more accurate, the results are 1·033 per cent., 1·397 per cent., 1·180 per cent., and 1·196 per cent. respectively, the method by which the 1·033 was obtained being I believe the most accurate. If you take beet, grass, potatoes, carrots, turnips, either leaf or roots, you will find there is a great deal of matter which is not albuminoid and yet contains nitrogen Potatoes are a good example of it, because the error in the analysis of potatoes has led to the most curious complications and most perplexing to the student of the chemistry of the food of animals. Potatoes have been thought to contain more than 2 per cent. of albuminoids, and therefore animals ought to lay on flesh when given them. But if you add potatoes to fairly rich food the animals lay on less flesh than they should. This has perplexed many observers, but when it is explained that potatoes only contain 1·2 per cent. instead of 2·4 per cent. of flesh formers, all perplexity disappears, because the other 1·2 per cent. of nitrogenous substances which have hitherto been calculated as flesh formers are utterly useless for the building up of muscle. As the first experiments on this matter were made at this College in 1873-4, I thought it should be introduced here, particularly as it is a subject of the last importance in analysing on a scientific principle the food given to farm animals. In a paper read before the Cirencester Chamber of Agriculture on the 2nd of October, 1878, I gave the results of some of my experiments, but these have been confirmed by eight or ten German experimenters since. Whatever process is used all the results are so nearly accordant that we may accept the lower figures as really correct. And now I would just say in conclusion how glad I am to have had the opportunity of speaking again from this place, and I am sure I have to return my best thanks to you, and also to your principal, and to my friend Dr. Prevost, for having given me the chance of once more speaking in my old lecture-room.

An improved toy pistol has been patented by Mr. Henry S. Lockwood, of South Norwalk, Conn. The improvement relates to pistols having their barrels pivoted so that the breech may be swung upward to permit insertion of a cap or cartridge. The object of the invention is to dispense with the use of springs or catches for holding the barrel in place, and thereby simplify and cheapen the construction of the pistols.

TRADE MARKS AND CHAMBERS OF COMMERCE.

Registration of Trade Marks.—The following letter has been addressed from the office of the Commissioners of Patents, London, by the clerk of the Commissioners to the Chambers of Commerce :—

"Sir,—

"I am directed by the Commissioners of Patents to request that you will be good enough to direct the attention of the Huddersfield Chamber of Commerce to the fact that after the 1st of January next the Trade Marks Registration Act of 1875 have been in force five years, and consequently that all trade marks which shall have been registered for that number of years, will under the third section of the Act referred to become the exclusive property of the owners thereof Every endeavour has been made by the registrar to prevent the registration of marks commonly used in the various trades and industries of the country, but owing to the knowledge of many of such trade marks or signs being confined to comparatively speaking few persons in the particular trades and industries, it is possible that some common marks may have been accepted by the Registrar in ignorance of their nature, and that such marks are not only still upon the register, but will, under the Act of Parliament before alluded to, become, at the expiration of five years from the date of registration, the exclusive property of the persons in whose names they are registered. Under these circumstances it has occurred to the Commissioners of Patents, that it might be very desirable, in cases where it has not already been done, that the respective Chambers of Commerce should cause an examination to be made of the representatives of trade marks registered during the past five years, in so far as concerns those relating to the branches of trade industry each Chamber represents, with the view of taking steps to remove from the register, before the expiration of five years, any common marks that may be upon it, so as to prevent the right to use such marks passing from the general body of the trade into the hands of private individuals.—I am, sir, your obedient servant,

H. Reader Lack,
Clerk to the Commissioners of Patents,
and Registrar of Trade Marks."

The rest of the meeting was mainly devoted to a discussion as to revision of a certain clause in the proposed new Great Northern Railway, and the Manchester, Sheffield, and Lincolnshire Railway Companies agreement.

EOZOIC AND PALÆOZOIC.

A correspondent (J. W. Dawson, of Montreal) in a communication to our esteemed contemporary, *Nature*, thus writes :—Permit an old worker in fossils to protest mildly against the slapdash manner in which writers sometimes hit off great palæontological questions. In your review of Roemer's valuable "Lethæa Palæozoica" it is stated that in regard to *Eozoon canadense*, he "accepts the verdict of Möbius against its organic origin, and rejects it from the list of palæozoic fossils." Now as to the acceptance of the "verdict" in question, I have nothing to say, except that the naturalist to whom are assigned the functions of judge and jury in the case very obviously lacks some of the qualifications for that high office, and has not been recognised by those best qualified to understand the case of *Eozoon*. But why Roemer or your reviewer should "rejedt *Eozoon* from the list of palæozoic fossils" I am at a loss to understand. As a writer on palæozoic fossils, Roemer has nothing to do with *Eozoon*. It belongs to that great series of eozoic or archæan formations which precedes the palæozoic, and which probably represents quite as long a period. Little comparatively is known of the fossils of these oldest rocks; but what we do know of their *Eozoon*, *Archæosophorinæ*, *Spiral arenicolites*, and *Aspidella*, and of their immense deposits of graphitised plants, is sufficient to assure us that the life of the eozoic period was very different from that of the palæozoic; *Eozoon*, whatever its nature, is one of the most characteristic of these eozoic fossils It has been recognised through a great vertical thickness of beds, and over so wide areas, that it is now equally characteristic of eozoic rocks in Canada and Brazil, in Bavaria and in Scandinavia. Further, it has obviously been connected with the accumulation of some of the greatest limestones of the eozoic time.

One can excuse a palæontologist familiar only with mesozoic or kainozoic fossils, when he doubts as to the organic nature of such obscure markings as *Oldhamia*, or even as to those wrinklings and scratchings on Cambrian slates which are recognised as trilobites and sponges; but we never think of asking him to accept or reject them as mesozoic fossils. In like manner those who are working out the dim traces of life remaining in the eozoic rocks will be content if geologists who scarcely condescend to recognise these great formations in their arrangements will abstain in the meantime from pronouncing judgment on eozoic remains supposed to be organic.

To us in Canada who have long regarded the eozoic formation as being quite as important in a physical point of view as the palæozoic, it is a matter of congratulation that they are now attracting so much of the attention of British geologists. Their palæontology, it is true, is still meagre, but our knowledge of it is gradually increasing, and those who have lived to see the Cambrian fauna grow from nothing to its present satisfactory condition need not despair of the Laurentian or Huronian

IMPROVED TEA KETTLE.

Probably our readers have often observed, in perusing our notices of recent American patents, that our Transatlantic cousins exercise much of their ingenuity in devising new arrangements for articles of domestic use, bringing invention to bear upon the improvement of articles of daily use, much to the advantage of home and family life. Amongst the latest of such efforts of ingenuity is an improvement in tea kettles, patented by Mr. W. S. Withers, and now being introduced by Messrs. Withere and Wolfe, 84, Whitehall-street, Atlanta, Ga., and described and illustrated in the *Scientific American*. This improvement is designed to prevent the possibility of the handle of the kettle becoming heated, a common occurrence with utensils of this class when placed over the fire, and also by the same arrangement to prevent the lid raising or moving from off the kettle, holding it firmly pressed down when it is tipped or inclined, thus avoiding the escape of hot water and steam. The invention consists in connecting the bail or handle—which is of the swinging kind, such as is adopted in pails—of the kettle with the lid or cover by a jointed rod, so that when the lid is closed upon the kettle the handle will be held erect, or, if the bail is turned over to the side, the lid, which is hinged to the kettle at that side, will be raised accordingly, and when the handle is grasped to raise the kettle, the lid is prevented from moving either vertically or laterally. When the lid of the kettle is closed the handle is held erect, and when the handle or bail is grasped and the kettle raised, the hinged lid will be held firmly against the body of the kettle over the orifice in its top, and thus prevent the escape of steam or water, as the lid cannot possibly raise or slip to the side, even though the kettle be turned half over in the direction of the spout.

The lid may be raised wholly or partially from off the kettle by depressing the handle which dispenses with the trouble and inconvenience of taking hold of the lid for that purpose, as is the case with the ordinary class of vessels of like character. The great advantage of this improvement is that the handle, not being permitted at any time to be in contact with the side of the kettle, cannot become heated.

EFFECT OF STARVATION ON THE BLOOD.

The *Scientific American* has recently been devoting much attention to some physiological facts resulting from Dr. Tanner's fast; and states that it was noticed that the quality of the blood varied greatly in different specimens obtained from day to day, and even in specimens drawn the same evening. It was at last found that if the blood was drawn from a very small puncture, from which it had to be pressed out forcibly, it was found to be in a much worse condition than if drawn from a deeper puncture from which it flowed freely. It is evident that in the first case it was drawn only from the capillaries, and in the second case from the larger vessels, in which a regular circulation takes place. This appears to prove that the abnormal corpuscles linger in the capillaries, and that it takes time to remove them therefrom, while in the larger vessels, in which free circulation takes place, restoration may have already been accomplished to a considerable extent. Close observation appeared to show that this restoration was taking place in two ways, by a cleaning and healing process of the affected corpuscles, and by the formation of new ones. The first was proved by the observation of corpuscles in all stages of the healing process from the most abnormal to the perfect smooth ones. Some of those which had become free of fungoid spores appeared, however, to have suffered considerably, some were partially destroyed, some were only half or parts of perfect corpuscles, and no doubt such will be either eliminated from the system or the defective parts healed up. Which of these takes place is a question. The second process of restoration was proved by the appearance of fresh and small corpuscles, looking very smooth and perfect, and bearing the stamp of youthfulness upon their appearance—we would almost say countenance—a freshness which became more striking the higher the magnifying powers were by which they were observed, in comparison with the affected corpuscles, in which the higher powers showed the imperfections more strongly.

This corroborates what other microscopists have observed in regard to the formation of new young blood corpuscles. It has, however, been denied by others who failed to observe it; but this is merely negative testimony, of which there appears to be a great deal in the medical profession; it proceeds from a kind of conservatism, which lies at the basis of all the medical intolerance manifested by the so-called regular school against all supposed innovations, even among their own brotherhood.

A striking illustration was offered in this regard by the discovery of Prof. Cohnheim, of Kiel, who found that pus globules could originate from the white blood corpuscles, but whose observations were most strenuously opposed at first by the majority of the profession, who could not see it. It may be mentioned here, as it has some relation to Dr. Tanner's fast, by which fast the number of his white blood corpuscles was more than quadrupled. It is well known that persons subject to privation of food have a strong tendency to pus formation and running sores, and if starvation increases the number of white corpuscles, these combined facts appear to support Cohnheim's theory. The opposition against it was, however, set at rest by Dr. Bastian, in London, and Surgeon Woodward, U. S. Army in Washington, who verified Cohnheim's observation, and by Huxley, who adopted it in his great lecture on protoplasm.

The number of white corpuscles did rapidly diminish after the fast in Dr. Tanner's blood and was soon reduced to the normal proportion; but the interesting change in the red corpuscles and their very gradual restoration during a length of time, is a contribution to science which Dr. Tanner has given after the end of his fast, and this should be acknowledged.

LAKE LEMAN.

Over thy bright blue bosom, placid lake,
I glide and sing a joyous song to thee!
'Tis eventide, and on thy shores I see
The phantom-lights: where thy clear waters break,
And ever and anon a murmur make.
While, by me wafts the wind so fresh and free,
And as I lean to watch the gurgling lee
The skies are mirrored, moving 'neath the wake.
By Chillon's walls I rest my oars, and dream
Of gory deeds and glory thou hast seen;
Which, thro' the vista of my vision gleam,
And gather forms, which picture many a scene:
'Mid pageantry of state a prisoner bleeds,
And shine brave Bonnivard's heroic deeds.

Henry George Hellon.

Clarens.

New System of Tanning Leather.—An important step in advance has recently been made in Germany in the science and art of tanning leather, and within the last few months the system referred to has been practically worked out on a sufficiently large scale in a small experimental or exhibition tannery in Glasgow, erected for the purpose of demonstrating the value of the new process by the Eglinton Chemical Company, of Glasgow and Irvine, who have secured the sole control of the inventor's patents for the United Kingdom, Canada, and the British Colonies. The process is the invention of a German chemist, Dr. Christian Heinzerling, of Frankfort-on-the-Main, and seems destined to result in a total revolution in the system of tanning which has hitherto been in use and is truly time-honoured, inasmuch as it entirely dispenses with the ordinary tanning materials—oak-bark and other astringent vegetable products—and involves the use of inorganic chemical compounds only, the special member of which is bichromate of potash. Generally speaking, it may be said that the other compounds—all of which are readily soluble in water—have as their function the decomposition of the bichromate of potash, so as to set free its contained chromic acid, which is really the chemical agent that exerts the tanning effect on the tissue forming the corium or lower layer of the animal hide. There are many considerations which seem to justify us in expecting great results from the adoption of the Heinzerling process. One leading fact is that it requires for its completion a period of only from four to six weeks, whereas the bark-tanning process requires from twelve to twenty or occasionally even thirty months for its completion. It has already been adopted in fourteen tanneries in Germany, and is being introduced into Russia, France, and Italy.

THE PHOTOPHONE.

In May, 1878, Mr. Alexander Graham Bell, well known in connection with the telephone, announced before a scientific society in London his belief that it would be possible to hear a shadow by interrupting the action of light upon selenium. At the recent meeting of the American Science Association in Boston, Mr. Bell read a paper describing at length his experiments in the production and reproduction of sound by light, and the invention by Mr. Sumner Tainter and himself of an instrument for the purpose.

The influence of light upon the electric conducting power of selenium is well known. Mr. Bell found the electric resistance of same selenium cells of peculiar construction only one-fifteenth as much in the light as in the dark. It occurred to him that all the audible effects obtained in the telephone by variation of the electric current by sound waves, could also be produced by variations of light acting upon selenium; and that with suitable transmitting and receiving apparatus voices might be conveyed without a wire along a line of light.

The fundamental idea on which rests the possibility of producing speech by the action of light is the conception of what Mr. Bell terms an undulatory beam of light in contradistinction to an uninterrupted beam; meaning by the former a beam that shines continuously, but is subject to rapid changes of intensity

The apparatus used to give the required undulatory character to light consists of a flexible mirror of silvered mica or thin glass. The speaker's voice is directed against the back of this mirror, as against the diaphragm of a telephone, and the light reflected from it is thereby thrown into corresponding undulations In his experiments, chiefly with sunlight, Mr. Bell concentrates upon the diaphragm mirror a beam of light, which, after reflection, is again rendered parallel by means of another lens.

The beam proceeding from the transmitter is received at a distant station upon a parabolic reflector, in the centre of which is a sensitive selenium cell connected in a local circuit with a battery and telephone. In a recent experiment, Mr. Bell's associate operated the transmitting instrument, which was placed on the top of the Franklin school house, in Washington, about eight hundred feet distant from the receiver, placed in a window of Mr. Bell's laboratory. Through this distance messages were distinctly conveyed by means of light. In his laboratory experiments Mr. Bell finds that articulate speech can be transmitted and reproduced by the light of an oxyhydrogen lamp, and even by the light of a kerosene lamp.

The rapid interruption of the beam of light by a perforated disc gives rise to musical tones, siren fashion. With this apparatus silent motion produces sound, loud musical tones being emitted from the receiver when no sound is made at the transmitter.

The importance of these investigations it is impossible now to estimate That the photophone can practically take the place of the telephone is not likely, though it is likely to work radical changes in military and other signalling operations. The heliograph, which has proved so useful in recent campaigns in the Afghan country and elsewhere, can now be made to talk orally yet silently over the heads of an enemy or across impassable streams or other low barriers. For rapid communication between distant exploring or surveying stations, the photophone also promises to be serviceable.

Another result of Mr. Bell's researches in this connection is the discovery that many other substances are sensitive to light. He has found this property in gold, silver, platinum, iron, steel, brass, copper, zinc, lead, antimony, German silver, Jenkins' metal, Babbitt's metal, ivory, celluloid, gutta percha, hard rubber, soft vulcanised rubber, paper, parchment, wood, mica, and silvered glass. The only substances found insensible to light are carbon and thin microscopic glass.

WELDING BY PRESSURE.

Pursuing his researches on the welding of solid bodies by pressure, M. Spring has subjected to various strong pressures (up to 10,000 atmospheres—150,000lb. per square inch) more than eighty solid pulverised bodies; this was done in vacuo, and in some cases at various temperatures. The results are highly interesting. All the crystalline bodies proved capable of welding, and in the case of bodies accidentally amorphous the compressed block showed crystalline fracture; crystallisation had been brought about by pressure. Softness favours the approximation of the particles and their orientation in the direction of the crystalline axes. The amorphous bodies, properly so-called, fall into two groups, one of substances like wax (*ceroid* bodies), which weld easily, the other of substances like amorphous carbon (*acroid* bodies), which do not weld. The general result is that the crystalline state favours the union of solid bodies, but the amorphous state does not always hinder it M. Spring says the facts described do not essentially differ from those observed when two drops of a liquid meet and unite. Hardness is a relative, and one may even say subjective term. Water may appear with a certain hardness to some insects, and if our bodies had a certain weight we should find the pavement too soft to bear us. Again, prismatic sulphur is changed by compression to octahedric sulphur; amorphous phosphorus seems to be changed to metallic; other amorphous bodies change their state, and mixtures of bodies react chemically if the specific volume of the product of the reaction is smaller than the sum of specific volumes of the reacting bodies. In all cases the body is changed into a denser variety, whence may be inferred that the state taken by matter is in relation to the volume it is obliged to occupy under action of external forces. This (M. Spring points out) is merely the generalisation of a well known fact. Some curious results are deduced from it The researches described have important bearings on mineralogy and geology.

A Table Land Across the Gulf Stream.—In a recent dredging expedition from Charleston, S.C., across the Gulf Stream, Commander Bartlett, of the United States Coast Survey steamer Blake, was surprised to find the depths much less than he expected. This induced him, although the trip was one primarily for dredging, to extend the work of sounding; and he accordingly ran a line of soundings nearly along the warmest band of the Gulf Stream, commonly called the axis of the stream, for a distance of 150 miles from latitude 32° to latitude 33° 30 north, on which he obtained depths varying from 233 to 450 fathoms, where it was supposed that the depths would range from 600 to 1,000 fathoms. At the north-east end of this line, in about latitude 33° 30′ north, the depth suddenly increased, in a distance of 15 miles, from 457 to 1,386 fathoms. These depths obtained by Commander Bartlett appear to indicate that a submarine table land may extend from the coasts of North and South Carolina across to the Northern Bahamas The development of this table land Superintendent Patterson proposes to have completed next spring, when the weather will be better adapted to such work than in the autumn and winter months.

A NEW PROCESS OF REFINING PETROLEUM.

The Philadelphia *Record* says that a new process for treating the products of petroleum is being tested in that city. At present all oils are brought to heat tests by distillation, and in the process lose from 30 to 65 per cent. By the old process oil at a fire test of 110° costs 6½ cents. per gallon. In bringing this grade of oil to a test of 150° it loses 30 per cent. in the process of distillation; to raise it to 175° it loses 45 per cent., and to 185° 65 per cent. By the new patent process the oil is treated without heat and loses nothing.

Oil at 110° that cost 5½ cents. per gallon, on being raised to a fire test of 150 is worth 13½ cents. per gallon; to 175, from 15 cents. to 17 cents. per gallon, and if raised to 185° is worth from 18 to 20 cents. per gallon. The cost of raising it to any of these tests is 1 cent. per gallon. Here, also, is another advantage over the old system, as by the present method of distillation the profit on oil at a fire test of 110 is only half a cent. per gallon, and at a test of 150 the profit is the same; whereas by the new process, the oil losing nothing in the manipulation, the profit is in a ratio to the number of degrees to which the fire test is raised In the process the oil is deodorised, and at the same time the illuminating quality is improved so that the oil burns longer and brighter, and this is effected without the aid of any heat whatever. This is what the inventors claim for the new process, but until a rigid and satisfactory test has been made they will disclose neither their plans nor their names.

A QUEER LOCOMOTIVE.

The *National Car Builder* condenses from the Paterson (N.J.) *Guardian*, a description of a new locomotive now in process of construction at the Grant Locomotive Works, which, it is thought, will eclipse for speed anything yet built. It will look like an ordinary engine turned upside down. The machinery will be on top of the boiler instead of under it, as usual, and the boiler will hang very low on the wheels. There will be two pairs of driving wheels, but instead of having them follow each other, one pair will be on top of the other. The real driving wheels will be the upper pair, and they will turn in the opposite direction from that in which the engine is going. They will rest upon the rims of the other pair, which will in turn rest on the track. The revolution of the upper pair, by friction, is expected to drive the lower pair, the tires of the latter serving as tracks for the upper ones. It is thought that a good deal greater speed can be got out of the machinery by this construction, and it is expected by the inventor that it will be the fastest locomotive ever made. Practical workmen, however, think it won't go at all. It will look very funny as it is running through the country, with the upper pair of driving wheels, five feet in diameter, revolving up in the air in the wrong direction at a tremendous speed, and the eccentrics, rocking bars, link motion, and pistons on the top of the boiler.

Mr. Hollis C. Trout, of Minneapolis, Minn., has patented a receptacle for mail matter, so arranged that its interior can be quickly and easily inspected without opening the cover. The sides of the box are formed of wire gauze or of glass, or glass protected by an exterior covering of wire gauze or any material that will permit a quick inspection of the box through the sides. The box is intended principally for the use of residences and stores as a receptacle for newspapers, but it may also be used as a receptacle for other mail matter.

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Furnaces and Fire-boxes, Supplying Furnaces with Fuel.—J. Henderson, T. Wardle and C. Lister, W. Horn and R. Bell, J. Teer, W. Morgan-Brown (com.), J. Salter, J. Fletcher, H Jones and E. Holt, J. Dean, G. A. Dick, R. W. Perkins and J. F. Flannery, E. Taylor, J. Neal, H. C. Bull.

Furniture, Bedsteads, Tables, Cabinets, Chairs, Desks, Wardrobes, Upholstery, Cabinet-work, &c.—G. A. Dallas, J. Horton, J. S. Henry (com.), E. Davies, J. Moulund, G. R. McKenzie.

Furs and Skins.—J. Lepine and P. H. Roelants.

Games and Exercises Billiards and Bagatelle Markers and Indicators for Games, Gymnastic Apparatus.—J. H. Weeks, F. Savage, P. Everitt, T. Saelt, J. M. Smith, W. Buttery.

Gas, Gasometers, Holders, and Retorts.—F. Weston, W. Brierley (com.), J. Macdonald, A. M. Clarke (com.), G. A. Dick, H. and T. C. Cockey, A. M. Clarke (com.), P. J. Wates, P Jensen (com.), A. Budenberg (com.).

Gas and other Burners.—F. Jones, P. Jensen (com), F. Knopp, W. R. Lake (com.).

Gauges, Water-level Indicators, Indicating Depth, &c.—A Nicholls.

Gems and Precious Stones.—J. Richardson, W. Hartnell (com.).

Glass (Making and Treating) and its Applications.—W. Horn, J. R. Bell, W. H. Beck (com.), T H Rees.

Gloves, Gauntlets, Mittens.—J. Lepine and P. H. Roelanto.

Grain and Seeds (Treating, &c.)—W. A. Gibbs, A. M Clark (com.), H. J. Haddan (com.) A. Steinberg (com.), J. H. Johnson (com.), H. Simon (com.)

Greenhouses, Hothouses, Conservatories, Forcing Pits, and Frames.—W. H. and D. Thompson.

Grinding, Crushing, and Disintegrating Corn, Grain and Seeds, and Dressing Flour.—W. J. Haddan (com.), J. Rae, F. Wirth (com.), R. Cooke.

Grinding, Crushing, Pulverising and Disintegrating Miscellaneous Substances.—M. Michaelis, W Hartnell, R. Cooke.

Grinding and Polishing, Smoothing and Surfacing, Emery, Sand, and Glass Papers, Cloths, and other Substances.—R. Luke.

Grinding and Sharpening. H. Woodward, W. F Smith, T. J. Coventry.

Harness, Saddles, Curbs, Whips, Releasing from Harness, Grooming Horses, Nosebags.—J. L. Babb.

Hats, Coverings for the Head, &c.—H. J. Haddan (com.)

Heating, Warming, and Evaporating, Obtaining and Regulating Heat, &c.—R. M. Ritchie, W. Standing, T. Ivory, H. Boscall, G. Jennings, J. Dann (com.), E. S. Sheard, J. A. Denton, J. Firth, A. M. Clark (com.)

Hinges, &c.—E. S. Shrubsole.

Hoists, Jacks, Lifts, Winches, Cranes, Capstans, Windlasses, Raising, Lowering and Moving Heavy Bodies, Raising from Mines.—J. M. Day, W. R. Green and H. C Walker, C. and J. I. Anson, T. Hudson, G. Howard, B Hunt (com.), R. C. Raper, R B. Jones, F. J. Hughes, E. B. Hughes, E. B. Ellington.

Horse Shoes, Shoeing Horses, Shoes for Animals, &c.—W. R. Lake (com.), L. W. Boynton.

Hygrometers.—L. Boye.

Insulating, &c.—J. W. Fletcher.

Jars, Jam Pots, &c.—J. Laycock.

Jewellery, &c.—R. Sonnenthal (com.)

Knitting, Looped Fabrics, Tatting, Crocheting, &c.—G. W. Hawksley and W. Lamb.

Knives, Forks, Table Cutlery, Knife Cleaners.—H. Woodward, J. McKenny, W. R. Lake (com.)

Lace.—J. Booth.

Ladders.—H. J. Haddan (com.)

Lamps, Lanterns, Chandeliers, Gasaliers, Lamp Furniture, Lighting and Extinguishing Lamps Artificial Light, Producing Light, Candlesticks, Candelabra, &c.—W. P. Thompson (com.), C. W. Torr, G. W. von Nawrocki (com.), F. Jones, J. Neil, G. P. Harding. W. Love, T. Knopp, F. H. Rees.

Lavatories, Washing Basins, &c.—E. W. de Rusett, F. P. and E. J. Preston, and J. F. Prestige, W. Towers.

Lead (salts and oxides).—W. Thompson.

Leather, Treating Hides and Skins, Parchment, Currying, Tanning, Cutting, and Ornamenting Leather.—N. J. Sorenson, J. Lepine and P. Roelants H. C. Webb, W. Nicholson.

Lime and its Compounds.—W. R. Lake (com.)

Locks, Latches, Bolts, Lock Furniture, Keys.—W. Sturmey, F. H. Steeds, W. H. St. Aubin, W. Masvitic, H. K. Bromhead, J. West.

Looking Glasses, Mirrors.—J. Whitfield and H. W. Atkins.

Manure, Treating Sewage.—C. Dickenson, J. R. Pickard, J. Bannehr.

Matches, Fuzees, Pipe and Cigar Lights, &c.—J. Rettie, F. Wirth (com.), G. W. von Nawrocki (com.)

Mathematical, Surveying, and Astronomical Instruments.—J. Milner, J. Imray (com.)

Mats.—L. J. Laird.

Measures, Measuring, &c.—J. Milner, H. J. Haddan (com.), J. Imray (com.)

Medicines, &c.—F. von Sandau (com.)

Metals (Annealing, &c.).—W. H. Neville.

Metals (Casting, Moulding, &c.)—L. A. Groth (com.), A Wilson.

Metals (Forging, &c.)—W. R Lake (com.), T. Nicholls, J Duffield, S Gallie, W. Bowker.

Metals (Plating and Coating, &c.).—W. H Neville, A. M Clark (com.), J. Tagell, A. M. Clark (com.), T. H. Rees.

Motive-power Machines, Obtaining Motive power.—H. Eaton, J. Robson, H. J. Hosmer, J. C. Chenhall.

Musical Instruments, Music, &c.—F. Wolff, A. A. Hely, S. Crokart, H. R. Schrubin, E. G. Brewer (com.)

Nails, Spikes, Bolts, Rivets, Screws, &c.—W. R. Lake (com.), L. W. Boynton.

Needles, &c.—J. W Hayes.

Oiling or Lubricating, &c.—C. Braithwaite, R. Parr.

Oils, Fatty Matters, Grease.—T. Williams, B. Hofmann, R. Good and R. W. Menzies, G. T Harrison, J. Swallow.

Optical Instruments, Optical Illusions, &c.—J. Swift, J. Betjemann.

Ornamenting, &c.—H C. Webb, R. Sonnenthal (com.) T. H Rees, J. G. Laird.

Ovens and Kilns.—R M. Ritchie, H. C. Bull.

Packing, Storing, Baling, &c.—T. Redmayne, F. T. Luland, J W Hayes, J. Bennie.

Paints, Colours, Varnishes, &c.—W. Thompson.

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Pens, Penholders, Pencils, Pencil Cases, &c.—J. Macleashan.

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Propelling Machinery, Transmitting Power, and Motion, Converting Movements.—O. Jones and W. O. Williams, J. Tagel.

Propelling Ships, Propellers, Paddle-wheels and Screws.—H. F. Phillips, A. W. L. Reddie (com.)

Pulleys.—G. Perrott, A. B. Childs (com.)

Pumps, Pumping and Forcing Liquids, Pumping and Raising Water and other Liquids, Pumps, Pistons, and Packing.—F. and S. Pearn and T. Addyman, T. Ivory, W. R. Lake (com.), C. Kessler (com.)

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Railway and Similar Buffers.—G. R. Hannay.

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Railway, Permanent Way, Rail Joints, Chairs and Sleepers, Portable Railways, Atmospheric Railways, Switches, Points, Crossings, and Turn-tables.—S. Lloyd, P. Jensen (com.), J. F. Redfern (com.), E. Rider, W. C. Wood, H. Aitken, H. Whitehead, R. Hodgson and T. Dodd, E. Guende, H. A. Bonneville (com.)

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Refrigerating and Freezing, Cooling Liquids, Making Ices.—T. B. Lightfoot, S. H. Linn.

Registering, &c.—B. Tower, J. M. Smith, A. Steinberg (com.), J. H. Betteley.

Respirators.—T. Harrison.

Ropes, Cords, &c.—C. Hirst, C. Hearnshaw and A. Holroyd, J. Taylor, W. Morgan-Brown (com.), R. B. Jones and J. Hughes, J. H. Scott, T. Archer.

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Spinning and Preparing for Spinning.—J. C. Vanlohe, T. Smith, J. Heaton, A. G. Boult.

Stamps (Revenue), &c.—C. Pieper (com.)

Steam and other Boilers, Cleaning and Preventing Incrustation of Boilers, Water Feeding Apparatus for Boilers.—H. E. Newton (com.), J. Henderson (com.), W. Morgan-Brown (com.), H. J. Haddan (com.), E. de Pass (com.)

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Telegraphs, Telegraph Printing Apparatus.—W. Morgan-Brown (com.), J. W. Fletcher, J. G Lorrain (com.), W. R. Lake (com.)

Tickets, Labels, &c.—W. R. Harris and J. G Cooper, J H Betteley.

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Tobacco and Snuff, Cigars, Cigar-Holders, Pipe and Cigar-lighters, Smoking Pipes, Tobacco Pouches, &c.—A. Vassilicos, J. Rettie, E. J. Kennedy (com.), S. P. Wilding (com.)

Torpedos.—P. Brotherhood.

Toys.—E. Davies.

Tramways and Tramway Carriages, Tramway Locomotives.—H. Aitken, T. Kendall, A. A. Bonneville (com.)

Umbrellas, Parasols, &c.—B. B. Cox, A. C. Wright and R R. Newton, C. D. Abel (com.)

Upholstery.—A and W. Briggs.

Urinal.—H. Phillips.

Valves, Taps, Stop Cocks, Plugs; Regulating the Flow and Pressure of Fluids.—J. Dewrance and B. Malcolm, W. Morgan-Brown, V. H. Dennis, M. Silvester, T. J. Henderson, H. W. Pearson and J. H. Howell, B. J. B. Mills (com.), W. H. Thomas. J. Woodward, T. J. Easey, A. M. Clark (com.), H. Marshall, M. Rogers, W. R. Lake (com.)

Velocipedes, Bicycles, &c.—J. White, C. F. Wood, H. J. Lawson A. G. Solomon, W. R. Lake, J. M. Smith, J. L. Emary.

Ventilation: Supplying and Purifying Air for Buildings, Mines, Ships, Carriages, &c.—A. Forrest, G. Jennings, S. H. Luin, T. H. Mitchell, W. Love, J. Martin, and W. A. Ward.

Washing, Cleansing, and Wringing Fabrics, Yarns, and Materials.—T. William, E. Clements, M. Sella, J. Petrie.

Watering and Irrigating.—N. G. Green (com.), J. H. Greathead.

Water-Power Engines.—T. O'Hara.

Window Blinds and Sashes.—R. W. Gossage, W. H. and D. Thompson.

⁂ *The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.*

Reviews.

THE ELECTRIC LIGHT.

"The Electric Light for Industrial Uses." By R. E. CROMPTON, Electric Light Engineer and Contractor. London: Mansion House Buildings, E.C., and Anchor Ironworks, Chelmsford.

MR. Crompton, in his introductory remarks, says that the electric light has passed out of the hands of the experimentalist into those of the mechanical engineer. Every day new installations of the light are announced and something is added to our stock of practical knowledge of the subject. After criticising the various books on electric lighting that have been published, he states that having been for some years engaged as a manufacturer of apparatus connected with the electric light, and more lately as a contractor for the temporary supply of electric lights for various purposes, he has felt the want of a practical handbook to be a great one.

"This want I now endeavour to supply. My desire to compress into my limited space as much as possible of what I believe to be the most recent and trustworthy information regarding the light must be my excuse for many shortcomings and omissions. I have endeavoured to be strictly impartial in my judgment of the merits of the various steam engines, dynamo-electric machines, conducting cables, carbons, and other accessories to the light. About the lamps I cannot speak so impartially. My whole aim for the last two years having been to combine in my own lamp all the merits, and exclude from it all the defects of my predecessors and rivals, must render my judgment favourable to my own to the exclusion of others."

Limited space throughout, Mr Crompton states, forbids him to give his authorities, but readers of Du Moncel, Desprez, Fontaine, Breguet, Mascart, Siemens, Schwendler, Preece, and Hopkinson, will recognise how much is due to the labours of those writers.

The work, which is one of only 41 pages, contains much practical information on the electric light. In proof of this we present our readers with the following quotation:—

"The contention is that Siemens' and Serrins' lamps fail in delicacy of feed mechanism; in other words, instead of advancing the carbons as they are consumed in a regular continuous feed, they advance it at considerable intervals of time, in quanities of one-eighth to one-sixteenth of an inch, accordingly as the lamp is clean and consequently sensitive, or dirty and consequently sluggish. The result of this intermittent feed is that the arc varies greatly in length, if the current is inclined to be unstable, as may be the case with low tension machines, the fluctuations in the strength of the current on which the lamp depends for starting the feed, are so sudden and violent that the current falls almost instantaneously so far below the point at which an arc can be maintained, and that the arc ceases and all current in the machine also ceases, until the carbons come together again and the arc is re-established.

"In early days of the electric light, these temporary extinctions, longer or shorter in duration, according as the lamp was regulated for a long or short arc, were quite expected and were not much grumbled at; but now the case is different, such lamps would not be tolerated for a moment Although the extinctions do not now occur with a well regulated Serrin lamp, the feed is still sufficiently irregular to cause the carbon points to constantly alter their form; each time a feed is made the light becomes pure white from the shortness of the arc, often hissing then takes place, as the arc burns longer, the arc gets quieter, and after passing the point at which it should be maintained, which we may call the normal arc, it gets far too long, the colour of the light changes from white to purple and blueish white, and the arc plays irregularly about the coned part of the two carbons, sometimes circling entirely round them, and giving a very irregular illumination of the floor space.

"The blame of these defects has been too often visited upon the unoffending engine which drives the machines, or upon the manufacturers of the carbons. In truth, neither are to blame. It is the feed mechanism of the lamp that is at fault If its feed mechanism were sufficiently prompt in responding to the small changes in the strength of the current, or to the slight differences of potential on the two sides of the arc, the feed motion could be made practically continuous, and an extremely steady and uniform light could be obtained with an indifferent engine and ordinary carbons.

If we consider that the feed mechanisms of electric lamps are in a sense analogous to the governors of steam engines, if we substitute the varying intensity of the magnetic field in the electro-magnets or solenoids of the lamps for the varying centrifugal force of the steam engine governor balls; again, if we substitute the mechanism which controls the advance of the carbons for that which controls the throttle-valve or cut-off gear of the steam engine, the parallel is complete The efficiency of a steam engine governor depends on its promptness in responding to the slight variations of centrifugal force of revolving masses of metal, the promptness is insured by reducing the mass of the parts actuated as far as possible; in other words, by giving the centrifugal force but trifling weights to start from one position of stability, and the same trifling weights to arrest in the new position of stability Any increase in the weight of the parts, however well and carefully counterbalanced, causes sluggishness in starting, and liability to overshoot the new position of stability before the motion of the parts is arrested This causes a swinging, or, as it is called by engine men, a "hunting" action of the governor. Carrying out this parallel further it will be seen that all electric lamps *hunt* more or less They do not commence to feed until the current is too much reduced, and do not arrest the feed until the current is too much increased by the carbons being approached too closely. In the Crompton lamp the same remedy is applied as has been before successful in engine governors. The weight and size of the moving parts of the break mechanism which controls the advance of one or both of the carbons has been reduced to a minimum; in some of these lamps the moving arcs only weigh a few grains. Thus the varying strength of the magnetic field of the lamp magnets has an extremely small amount of work to do.

"A general idea of the arrangement of lamps, as far as it can be obtained without reference to diagrams, is this:—The upper part which contains the mechanism consists of a pair of top and bottom plates united by a pair of flat frame plates, which form the sides carrying the train of wheelwork. This part is covered in by a glass cylinder held at top and bottom by grooves in the plates. The movement can thus be watched without removing any cover. When the lamp is intended to burn more than five hours it is extended below the bottom plate in the form of a large tube, which carries at its lower end the guides to steady the long carbons required; these carbons are steadied through a platinum contact at the bottom of the large tube. Thus the length of carbon between contacts remains constant during the time the lamp is burning, and the carbon resistance therefore remains constant also. This is a point of considerable importance, as the resistance of 24 inches, or sufficient length for eight hours burning of carbon, is about ·3 ohm., and the reduction of this amount of resistance at the time when the lamp is fresh lighted to practically nil when the carbons are burnt out would seriously alter the current when this is of low tension, When lamps are to burn less than five hours. this carbon resistance being not so important and the carbons being stiff enough to support themselves in line without the aid of guides, this lower part is dispensed with."

Although Mr. Crompton cannot, as anyone will see, refrain from praising his own invention, yet we can assure our readers that his little work contains much practical information on the subject at large.

COLONIAL EMIGRATION

"Extended Colonisation a Necessity to the Mother Country." A Paper read at the opening meeting of session 1879-80 of the Royal Colonial Institute. By STEPHEN BOURNE, F.S.S. London: Unwin Brothers, 109A, Cannon-street, E.C.

MR Bourne argues very lucidly and impressively that emigration is one of the most available means for promoting the welfare of this country and its inhabitants, and thus sums up the matter —

In the Colonies there is abundance of unoccupied land, every variety of climate, every description of food and of material for clothing. Pioneers have gone forward to prepare the paths for those who are to come after them, so that there are few places in which friends and companions are not to be found; whilst postal and telegraph communications keep up constant and close intercourse with those who may be separated by wide continents or broad seas. In many of our possessions, and in other uncivilised parts which are ready for forming attachments with us, there are large bodies who would soon become our customers for merchandise and our growers of food with whom a profitable trade will in time be developed, if only we send as settlers amongst them those who are prepared to cultivate amicable relations rather than to extort from them the goods or the labour they have to give; to carry the gifts of civilisation rather than those of the sword.

In former times two classes were disposed to emigrate—those whose spirit of enterprise and desire for wealth led them to brave hardships, in the hope of returning home to spend their later days in ease and plenty; and those who, having misconducted themselves or otherwise broken down at home, found it desirable to seek new places to live. Hence Colonial life was rude and rough. Few cared to become steady settlers, or to cultivate the comforts and happiness of home. These may still go in considerable numbers, but we also want those who, with settled intention and hearty desire, change their country, but carry with them or speedily make permanent homes wherever they go. The increasing numbers and the rapidity with which these are added to in newer countries, forbid the expectation of return. The many must, once for all, transfer themselves to the fresh locality, seeking to make it as much like the old one in everything that is good, and as much unlike it in everything that is ill, as they possibly can. The feeling must not be that of expatriation, but that of extending the borders of the fatherland.

This, too, should be the spirit to actuate the Home Government in all its relations with existing or yet to be formed Colonial possessions All distinctions of laws and customs should be swept away, and the same principles and methods of rule should be adopted, or only withheld for a time in the case of untutored natives. Whatever institutions, religious, educational, scientific, or philanthropic, have been found to work well at home, should be founded, improved, and adapted to the special requirements of each place. Whether it would be possible to form an entire federal union of all parts of the British Empire, so as to have the same fiscal laws and regulations, is too wide a subject to be entered upon on this occasion: but there can be no question that if practicable it should be adopted, and if not altogether feasible, that no unnecessary obstacles should be placed in its way, or any departure from its spirit encouraged If it be necessary for revenue purposes, on account of the different positions in which they are placed, to have different rates of duties on the importation of goods, they should undoubtedly differ as little as possible, and every attempt to establish Protection on either side as against the other be utterly repudiated.

It is the duty of the mother country to set the example and exercise her authority for the general welfare, but it is also the duty of the children to follow and acquiesce in that which is for the benefit of both. The idea of separate interests or independence of each other is utterly inadmissible The object on all sides should be to draw tighter the bonds of union, to weld every portion of our dominions together into one harmonious whole, to make everyone with in the bounds of the British empire feel and act as an inhabitant of the one kingdom

I have spoken of the necessity imposed upon the mother country that she should extend and perfect the colonisation of her numerous possessions, but is it not equally a necessity to those possessions that they should be fully colonised? She has more than an abundance; they, with few exceptions, a paucity of population She is unable to raise her own food, they can raise more than they can consume. She has a plethora of wealth which seeks employment in foreign lands; they have need of more than she can give to develope their untold resources. She has the knowledge, the refinement, the treasures of art and science, accumulated in the course of the years that are past; they have yet to obtain these invaluable possessions in the years that are to come. The necessity is mutual; let both be gainers by its being met and supplied. These are considerations which can no longer be neglected or evaded. They force themselves upon us in our homes and our offices, in the palace and the hovel; they should tax our intellects and lie near our hearts. When these sentiments prevail, and—presumptuous though it may be in me to say so—not till then, will there be any solid return of national prosperity. Whensoever they are held by the leaders of public opinion, and responded to alike by the voice of those at home and those in our colonies, the work will be viewed as the most important that can occupy public attention, and all together will join in its performance. Then the most important and influential member of the Government will not be the Minister who sits at the Home Office, not the one who presides over War, not even he who rules at the Exchequer, but the honoured individual into whose hands Her most Gracious Majesty commits the affairs of the Colonial Office.

THE WATER SUPPLY.

"Domestic Plumbing and Water Service." By William White, Fellow of the Society of Antiquaries and Fellow of the Royal Institute of British Architects. London · Crosby Lockwood and Co., 7, Stationers'-hall Court, Ludgate Hill. 1880.

Mr. White, who is eminent not simply as an architect, but as a sanitary improver, states that in commending the pages of his work to the favourable notice of his brother architects, his medical and other scientific friends, and the public generally, he may obviously and reasonably be presumed to write with a certain amount of bias, from having a personal interest, as an inventor, in several patented sanitary appliances. The appliances specially referred to being those made by Messrs. Frank Pierce and Co., Shrewsbury Sanitary Works, 1 and 2, Little York Place, Baker-street Station; viz. the Shrewsbury Valveless Closet (with valveless Water-Waste Preventer and Regulator); the Shrewsbury Wasteless Lavatory; the Shrewsbury Automatic Ball-valve, and other waterway taps; and certain Domestic Fittings.

Nevertheless, Mr. White wishes to express his conscientious conviction that the fullest inquiry into the questions discussed, and the fullest information afforded to the general public as to practical details in such matters, will be for the common benefit of all.

He ventures further to indulge a well-grounded hope that the principles upon which these practical details are here treated will meet with careful and impartial consideration.

The work refers to the water service, the water closet, the water valve, the drain ventilator, and remedies for existing evils. Probably the most important question treated of in this little work is .—

THE WATER VALVE.

The occasional accidental running away of water from the household cistern, to those especially whose supply is limited, has been for many years a constant source of vexation, inconvenience, and expense. At times I have lost my daily store of water, day after day, before discovering the cause, which has eventually proved to be due to the valve of one or other of the several w.c.'s getting occasionally (but not continuously) propped by the handle, or by the valve being improperly fitted, or some similar cause.

For purposes requiring an excellent flush, with a strictly limited quantity of water, it is proposed to do away with this valve altogether, substituting for it something which is capable neither of leakage, nor yet of wilful or careless waste of water from being purposely propped or accidentally left open

The valve at present ordinarily used to serve the basin of the w.c. being one of the most fruitful sources of waste, its total abolition will prove one of the greatest boons in respect of domestic water supply yet brought before the public The cost of good valves at first, and in successive adjustment and repair, their inevitable liability to leakage, and other derangements; the difficulty of getting fullway valves of large capacity and keeping them in working order when obtained; their frequent damage from frost, obstruction, wear, or neglect, must render a satisfactory substitute for them a matter for general rejoicing.

The new apparatus, of course, like all other water apparatus, may be disabled, though it is not liable to be deranged, by frost But pipes, closets, and valves ought always to be securely protected against the effects of frost, and in ordinary circumstances and positions this may easily be done by casing and other means. Even a common brass French oil hand-lamp will keep out frost from a good-sized cistern, when protected from draughts of freezing air.

A ball or floating valve-tap to feed the waste-preventer cistern, whether by constant or intermittent service, will still be required. In the working of these ball-valves, however, great and manifest improvements have now been made, by a further invention which will reduce to a minimum the chances of leakage and waste. This is effected by the adoption of an entirely new principle in their construction, the very opposite to that hitherto generally used; which principle ensures its immediate and automatic action in closing. The only force required to open the valve is applied below, or externally to the waterway. Under high pressure this force is very considerable, and is met by a simple method of single or compound lever as the case may be, its action being by way of direct counterpoise to the column of water within. It is without stuffing or packing of any sort, and quite free from all liability to stiffness or sticking.

It is evident that in the adoption of such a ball-tap, combined with a valveless and waste-preventing regulator, incapable in its operation of leaking or of being left running, the most complete provision that can be devised against waste is obtained.

BRITISH WILD FLOWER.

"British Wild Flower, by Natural Analysis." By Frederick A. Messer. London: Bogue.

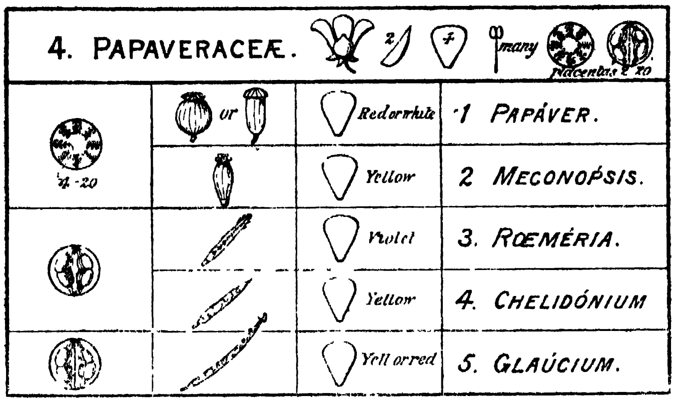
[Second Notice.]

The principle of analytical arrangement, so useful in bringing before the student in a concise manner the relationship which plants bear to each other, has hitherto been confined to verbal description. In Mr. Messer's work is presented the novel feature of the application of this principle to the illustrations, as well as to the verbal description; the illustrations being placed on one page and the letterpress on the page opposite. Thus the information is expressed in two distinct ways.

There can be no doubt that this system of dealing with illustrations will greatly facilitate the acquisition of a clear and comprehensive knowledge of our native plants, and will be found especially useful as a rapid means for their identification. Instead of struggling through a stockage of technical terms the beginner can, by this new method, readily perceive the relationship which the parts bear to each other, and at a glance discriminate with certainty which of the figures agree with his specimen and *which of them do not.* The mind will be freed from that feeling of doubt as to whether after all the right selection has been made, which is unavoidable when studying by the aid of letterpress alone. Thus the student's progress will not only be rapid, but at the same time sure. Should this work lead to the orders and genera receiving greater attention it will do good service. One of the principal difficulties experienced by the field botanist is created by his neglecting the study of the ordinal and generic features and devoting himself too exclusively to species as individuals. This devotion renders his experience of little benefit in future investigations; whereas had he more fully studied the orders and genera he would have been enabled to recognised at once a plant's affinities.

The illustration we give (see next page) of Mr Messer's work will convey a good idea of the system upon which it is based. We may mention that want of space has compelled us to contract the letterpress part.

"Tears and Rainbows."—It has frequently been observed that a desired impression can sometimes be produced by poetry when all else fails, and hence it is that it has been successfully employed for imparting religious instruction as well as for the exciting of the most dangerous human passions, but in poetry of a religious character the author is apt to overstep his bounds, and exaggerate to an extent which renders his labour fruitless; it is, therefore, quite refreshing to turn to such a volume as "Tears and Rainbows, or Heavenly Sunbeams on Earthly Sorrows," by the Rev. Professor George Butler Bradshaw (London: A. Bachhoffner, High-street, Clapham), which, although purely religious in tone in every line, is altogether free from the overstrained style too often adopted. Throughout the whole of the 35 poems contained in the volume, there is the ease and smoothness which indicate the possession of that poetical faculty which no amount of teaching can impart, whilst the subjects selected will suit the tastes of every cultivated reader. The author displays in every line his love of Nature and his confidence in his Creator, feelings which will not fail to be generally appreciated. More scholarly and accurate poetry could not be desired, yet it has a softness and gentleness which will make it attractive to the least as well as to the most highly cultivated, whilst the fact that it will prove equally acceptable and agreeable whatever may be the reader's sect or creed, justifies the prediction that the second edition which has now been reached will not be the last. Apart from the pleasure which the volume will afford, it may safely be said that no one will read it without deriving instruction and advantage, and would appear to be very suitable either for a prize book or Christmas present.



4. POPPY FAMILY. Corolla regular, polypetalous, inferior. Sepals 2. Petals 4. Stamens many. Capsule 1 or 2-celled; placentas 2 to 20, many-seeded.

Capsule 1-celled; placentas 4 to 20 (forming imperfect cells)	
Capsule globular or oblong. Petals red or white	1. Poppy.
Capsule obovate. Petals yellow	2. Welsh Poppy.
Capsule 1-celled; placentas 2.	
Capsule linear, bristle-pointed. Petals violet	3. Rœmeria.
Capsule linear, smooth-pointed. Petals yellow	4. Celandine.
Capsule 2 celled; placentas 2	
Capsule very long, curved. Petals yellow or red	5. Horned Poppy.

SHREWSBURY PATENT CLOSET.

This closet (which is alluded to in the review of Mr. White's pamphlet on Domestic Plumbing and Water Service) is placed behind a casing at the back or side of the closet. The contrivance consists in drawing, from the top of a small cistern *c* (Fig. 6) holding a regulated supply, enough water to form an efficient flush, through a properly formed hopper basin. This is effected merely by means of a movable flap or tray, *t*, within the cistern, by the raising of which the requisite quantity is lifted out, whether bodily or by pressure against the sides, into a funnel, *f*, and so discharged by a pipe *p* into the basin beneath, through which it rushes, clearing out the contents. It will be seen that this small cistern, having no opening except at the top, and being without any valve or other outlet for the water below, cannot be liable to leakage or other derangement. The hopper or flushing basin (Fig. 7) is of such form as to hold as much water (w) as an ordinary pan or valve closet, and thus is capable of being kept equally clean; whilst it is at the same time capable of being thoroughly flushed. It has provision for a circulating system of ventilation in the trap which cuts off the soil pipe. The basin being of good form, and of Wedgwood, or other good ware, its use for the better class of houses will not be open to the objections which have hitherto entirely prevented the adoption of all descriptions of hopper or flushing basins for anything but the cheapest and commonest purposes. The whole apparatus is complete in itself, the basin requiring only to be placed upon a wood block or a frame on the floor of the closet; and, being fixed eight inches *above* the floor, it is easily made good into the soil pipe. The cistern is fixed on a bracket or shelf above, the only other requisite being a half-inch or three-quarter inch supply of water, laid on ready for the attachment of a ball-valve at *b* (Fig. 6) to the apparatus cistern; and some pipe for ventilation below the basin at *x* (Fig. 7) to prevent syphoning, and to create a current of air in the pipe. The apparatus cistern, described above, forms an effectual regulator and water-waste preventer, in one; holding as it does the required quantity of water for each discharge. Seeing that the volume of water thus lifted out at one moment is from one to two gallons, the service pipe may be of any reasonable capacity, and a flush of two inches or more readily obtained. The quantity may be accurately regulated by the adjustment of the ball-valve.

A further advantage of this arrangement is that by means of it the separate cistern (now required by all Sanitary Authorities) is of necessity already provided, without the cost or inconvenience of any other intermediate cistern for the purpose of separating the closet service from that of the house. The supply cistern of the house can thus be placed at such a distance from the the closet, or other tainted position, as to secure it from contamination.

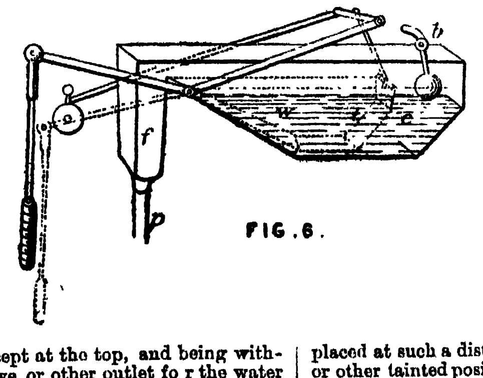
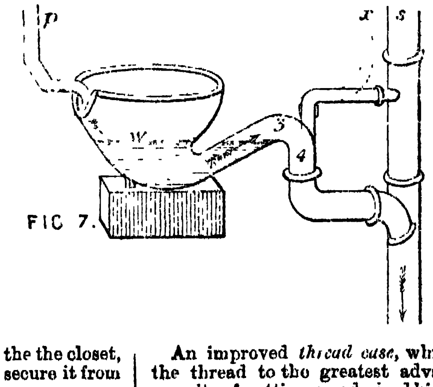


FIG. 6.



FIC 7.

This waste-preventing regulator might be made applicable, if desirable, to existing pan or valve closets of the common sort. But it would not be desirable. Those who care only for the prevention of waste might rest content with this. But those who would escape the evils of such pans or valves must have recourse to the special application of the regulator provided by means of the new flushing pan. The same may be said of the common hoppers or old flushing pans. It might be made applicable to these; but according to their present usual construction, and for the reasons before given, only the benefit of waste-preventing would be obtained. Their nozzle (*n*, Figs. 3 and 4) for the inlet service pipe would be far too small to allow of a sufficient quantity of water being admitted for proper flushing: in fact, in order to keep such basins clear, it is the common practice to throw down a pail of water occasionally. Cheap and common sorts of the Shrewsbury closet will necessarily be required in many cases, for cottages, and for servants' offices. In order to meet these requirements, arrangements have been made for their supply, of the proper form under the patent, for adaptation to the new waste preventing flusher.

In the hopper or flushing basin, to be used with the water-waste-preventing flusher just described, there is a provision for rinsing the sides. The two-inch pipe *p* is brought down, through a notch or indention (Fig. 7) over the edge of the basin without interception or interruption by any joint or other inequality, and the full force of the water is thus still given to the operation of flushing.

It may, perhaps, be desirable to remind our readers that Mr. White, F.S.A., of Wimpole-street, is the originator and patentee of the above-described invention.

A NEW method of preserving raw meat for six months has been discovered by Prof. Artimini.

An improved *thread case*, which exhibits the thread to the greatest advantage, and permits of getting any desired kind of thread instantly and easily, has been patented by Mr. Eugene L. Fritch, of Bieda, Iowa. The invention consists in a case with a glass front and top, and with a floor inclined from front to rear, and provided with a series of drawers, each containing a number of spools of thread which are held by spring catches at the end of the drawer, so that if a button on the drawer is pulled a corresponding spool will drop from the drawer and roll down the inclined floor toward the salesman.

The Scientific Review

AND

SCIENTIFIC AND LITERARY REVIEW,

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Established 1st May, 1862.

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President, SIR ANTONIO BRADY.

THE SESSION 1880—1881

Is to commence with the Opening Meeting on Thursday, 25th November, at 4.30 p.m.

Members' Meetings at 8 p.m. on Thursdays, November 25th; December 9th and 30th; January 13th and 27th; February 10th and 24th; March 10th and 24th; April 7th and 28th; May 12th and 26th; and June 9th.

Annual General Meeting, Thursday, May 26th, at 4 p.m., unless otherwise arranged.

Subscriptions are payable to Mr. G. A. Stretton, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. Campin, Sec.

Proceedings of the Institute.

The Institute having been out of Session, no meeting has been held which requires a report.

On Thursday, November 25th, it is proposed to have the Inventor's Dinner, and the Opening Address will be delivered.

Monthly Notices.

Electric lamps, fourteen in number, light the railway up Mount Vesuvius. The illumination of the crater and the sides of the volcano is, according to the *Elektrotechnische Zeitung*, grand in the extreme.

Mr. James Blyth, of Edinburgh, has been elected to the chair of Natural Philosophy at Anderson's College, Glasgow.

H. Radziszewski, in Liebig's *Annalen*, publishes his experiments on the carbon compounds which exhibit phosphorescence. According to him, the phenomenon occurs with those compounds which combine in the presence of alkalis with ozone or active oxygen, or possibly in some cases with peroxides.—*Athenæum.*

Indian Portland cement is amongst the most recent of Indian manufactures. By a simple and almost purely mechanical process, a cement capable of bearing a pressure of 650 to 1,000 pounds and upwards is produced from ordinary *kankar* combined with a certain proportion of purer limestone of local origin. A company has been formed, and works have been erected for the production of the cement of Sealdah.—*Athenæum*

Liquefied Ozone.—MM. Hautefeuille and Chappuis announced at a recent meeting of the Académie des Sciences they had produced liquefied ozone. They secured this end by great reduction of temperature, and the passage through the gas of the silent electrical discharge. The gas first assumed an azure blue colour; under a pressure of several atmospheres, it appeared of a dark indigo blue. At ninety-five atmospheres, when suddenly removed, the tube was at once filled with a mist, indicating liquefaction. Ozone was shown to be explosive: if a mixture of oxygen rich in ozone be rapidly compressed at ordinary temperatures an explosion takes place.

The United Arts Club is the name of a new institution in formation at Lancaster House, Savoy, W.C. The names of the honorary committee comprises.—Sir Julius Benedict, H. J Byron, Luke Fildes, A.R.A, W. P. Frith, R.A., E. W. Godwin, F.S.A., Henry Irving, Blanchard Jerrold, J E. Millais, R.A, E. Solomon, Edmund Yates, and other well-known names. The United Arts is to be entirely a social club, formed for the purpose of facilitating intercourse between members of the literary, dramatic, artistic, and musical professions, and candidates must be prepared to show that they possess the necessary qualifications. The annual subscription is three guineas; and the entrance fee is three guineas. The subscription payable on election rendering the member free of further payment until January, 1882. Mr. G. Earn Murray is the secretary and manager.

Burns's Poems in his handwriting has been presented to the Trustees of the Burns Monument at Ayr. It is a small quarto of fifty pages, and was given by the poet to Mrs General Stewart, of Afton, in 1787.

The Newnham College, Cambridge, Lectures this term include courses by four lady lecturers, Miss Crofts, Miss Merrifield, Miss Harland, and Miss Scott. M. Boquel intends to make *viva voce* translation into French from Lord Lytton's "Caxton's" a prominent feature of his course. The lectures are now delivered in the North Hall of Newnham College.

Mr Joseph Anderson has recommenced at Edinburgh his *Rhind lectures on archæology*. He is still dealing with "Scotland in Early Christian Times," and the first lecture of the new series was devoted to "Decorative Metalwork." His other topics are "Decorative Stonework," "The Art of the Monuments," "The Symbolism of the Monuments," and "Inscribed Monuments."

M. Cros drew the attention of the Académie des Sciences, on October 11th, to a memoir presented by him in 1872, in which, guided by theoretical considerations, he drew conclusions on the mechanical action of light, which he thinks have a great similarity to those of Prof. Bell. For example, a ray of light sent into a tube resonating with a certain note was interrupted a corresponding number of times in a second, and thus by the alternate condensation and rarefaction of the air sounds were produced.

THE SCIENTIFIC REVIEW
AND
Scientific and Literary Review

NOVEMBER, 1880.

REMEDIES FOR INDUSTRIAL DECLINE.

No one, we think, will gainsay the statement that if we can cheapen and improve to the utmost our industrial productions, we must be doing all that can be done to remedy any depression of trade that may exist.

But the utterance of an apothegm, however true, is merely speaking out "prave worts," as Shakespeare's Sir Hugh Evans calls them. We must, to be useful, go beyond this, and point out the course of action that is to be adopted in order to give practical importance thereto.

To us this is a matter of the greatest simplicity for we cannot give any better advice than what we have already put forward in the pages of the *Scientific Review*, namely, the promotion of technical education, or rather, instruction in practical science in regard to its applications to our arts and manufactures, and above and beyond this the enactment of good and cheap Patent Laws.

Probably these assertions will be met by the cry that is your old story; and we should have been disinclined to have again reiterated what we have so often stated, had we not been able to place before our readers the opinions of a new advocate for the amendment of our Patent Laws.

We refer to Mr. STANDFIELD, a scientific engineer, who has recently published his views on the subject and submitted them to discussion at a recent meeting of the Institution of Mechanical Engineers. He affirms that the cheap Patent Law of the United States has been and still is the secret of the great success of that country. . . . The invention we suppress takes root freely in the United States, which, consequently supplies our marts with large quantities of labour-saving devices, whereas if our laws were fair and equal we should supply their marts, and use the proceeds for purchasing their grain without impoverishing our country by a great loss of capital as at present. In the course of the discussion it was remarked that it was evident that there was something wrong when America could pay £9 where England paid £6 per ton for iron, and 9s. instead of 6s. per day for labour, and yet beat the English in the open market. He thought it was the duty of the Board of Trade, when the country was losing its trade, to inquire as to the cause of it. There was only one reason for it, and that was the abundance of labour-saving tools used by the Americans, because their mechanics could get all their appliances protected so cheaply.

Mr. Standfield pointed out that by suppressing native genius through heavy patent fees, England had driven away many national industries in which she had once held a foremost place. The pianoforte trade was one, London being rapidly stocked with instruments made in New York. The watch and silk trades had been driven out of Coventry and Clerkenwell, while machine-made watches were being developed in America, where labour was 50 per cent. dearer. American cheap patents and labour-saving tools alone account for Coventry's and Clerkenwell's misery and decay, and for England's serious loss of revenue and national income. If our workmen were allowed to become inventors they would prove quite as well able to design and manufacture machinery for the construction of cheap watches as the Americans. On the present system our best mechanics, if they have any ambition, are compelled to emigrate to America, where alone they can find an opportunity of utilizing their genius."

Further on the speaker said. The American patent law have given the inventors of such small but useful articles as sewing machines such a good opportunity of universally introducing their inventions that it is now not worth the while of any manufacturer here or elsewhere to attempt to compete with the American houses. There are 4,000 skilled artisans employed in the United States in this small manufacture alone. While American organs of numerous descriptions are not only excellent but cheap, there is not a single cheap English organ known to the public.

What has occurred to our piano and watch trade is now occurring—if it has not already occurred—in regard to the manufacture of locomotives and many other manufactures, to the partial ruin of our trade, wealth, and empire.

In the course of the discussion, the apathy of inventors and industrial pioneers as regards patent reform was alluded to. We certainly must admit that this is unfortunately too true. We would desire to arouse them. Let them be up and doing. The Inventors' Institute is to re-commence its labours in the present month. Let them rally round it with the dogged determination to secure a really cheap and good Patent Law. Messrs. Anderson, Hinde Palmer, Broadhurst, Mundella, and Brown, M.P.'s, have a Bill prepared ready to be launched in the next session of Parliament, and the Working Mens' Congress have declared in favour of Patent Law Reform. So let the watchword be Onwards! Onwards!! Onwards!!!

Proceedings of Societies.

ARISTOTELIAN SOCIETY.

Oct. 11th.—Mr. H. S. Hodgson, President, in the chair.—The President delivered an opening address. After a few introductory remarks relative to the past and future work of the Society, the meaning of the term "philosophy" was defined as being the most complete *rationale* of the universe possible to man, The axioms and laws of any subject constitute its science; the explanation of the facts which lies at the root of the laws governing it, which connect that subject with higher or larger subjects, is its philosophy, The question as to whether philosophicial truth is finite or infinite was then touched upon. In studying the history of the progress made towards a satisfactory *rationale* of the universe, *i.e.*, the history of philosophy, it is important to note that there is a main highway which leads to the final aim, and that there are side ways. It is for the student to decide whether the work or theory before him is in the high way of philophy, or is a subsidiary inquiry or a false start The successive advances and retrogressions made in ancient philosophy, beginning with the Ionic school and ending with Neo-Platonism—the portion of the history of philosophy studied by the Society in its previous session—were then noticed, the grand result being the elaboration of a great philosophical system by Aristotle. The work of this great philosoper was then treated of, and its past and present influence upon the religions of mankind, more especially on Christianity, was indicated. The struggle between Gnosticism on the one hand and Christianity on the other, resulting in the victory of the latter, was depicted, the fusion of this latter theological philosophy with the Aristotelian system producing the great philosophical system known as Scholasticism, which still remains with us; the principal question about Scholasticism to be decided by the student being not whether it could claim to be a philosophy, but whether the *rationale* offered by it was a true and sufficient one. The influence of the Renaissance, the Reformation, and scientific progress upon philosophy, was then mentioned; in the last case the scientific conception of relations taking the place of the scholastic conception of causes. The general difference between ancient and modern philosophy was shown to consist in the increased predominance of subjectivity in the latter, which asks what we know about things and what they appear to us as being, the former inquiring simply into what they are. This change of attitude turned men's attention to the analysis of the mind, its functions and modes of operations, giving rise to modern psychology. The importance of physiological psychology as an indispensable auxiliary of philosophy was insisted upon. The important work accomplished in philosophy by Kant was pointed out as a subject for much deliberation and discussion during the ensuing session. The philosophic systems of modern times then received passing notice. The study of philosophy was shown to be chiefly important for the light which it throws upon the state of philosophy itself at the present time, though it may also be advantageously studied from another point of view, that is, not so much in relation to its subject matter, philosophy, as by treating it as a portion of the general history of mankind. A third method is pursued by those who possess what they consider to be the true, final, and sufficient *rationale* of the universe, viewing the history of philosopy in relation to their own theory, as in the case of Scholastics, Hegelians, and to some extent with the Comtists, the last reading by means of the law of three stages, not being so strictly dogmatic as either of the first two. The address concluded by dealing with the position of the Society with regard to these three methods of studying the history of philosophy by its adoption of the first plan of study.

FLETCHER'S GAS HEATING BURNER.

Mr. Thomas Fletcher, of Museum-street, Warrington, who is well known as an eminent practitioner of the art of producing gas and petroleum furnaces suitable for use in laboratories and manufactories of various kinds, has recently given much attention to the production of gas heaters suitable for domestic and general requirements; the result being the production of a heating burner which, after much experiment and very conclusive trials, has been found to possess the highest degree of efficiency. Having ourselves well used this burner we can testify that it is, without exception, a most valuable instrument for the production of heat for a variety of purposes. It has from three to four times the power of any burner similar in appearance; it being an arrangement horizontally on the Bunsen principle with the flame issuing from a gauze dome. The flame is *solid*, intensely hot, and perfectly free from smell. It gives a duty *higher than the calculated theoretical maximum* for the gas consumed It cannot be damaged by the dirtiest work. In case the perforated copper dome gets choked with dirt, it can, when the burner is warm, be lifted off and washed or brushed clean. Any liquid spilt so as to get inside the burner flows out by the side tube without the possibility of damaging the burner. Allow me also to call your attention to the casting of the body of the burner, which is cast all in one piece without a joint, thus doing away with one great fault—causing liability to leakage—in most of the burners at present in use Mr Fletcher states, and we have no hesitation in expressing our concurrence in his statements, that he considers this burner one of the greatest advances yet made in the practice of heating by gas Mr Fletcher has a gas fire arrangement, to fit this burner, in preparation.

As regards the applicability of this burner to cooking by gas, patented and manufactured only by Thomas Fletcher, 4, and 6, Museum-street, Warrington, the following remarks by Mr. Fletcher may be interesting:—

We have, he says, used gas to the total exclusion of fires for cooking for the last 18 years. During that period constant experiments have been made, and the system repeatedly remodelled, with the object of getting the most perfect results with the least trouble and expense, for our own convenience. The matter is, therefore, so far as practical necessities are concerned, by no means new, although I have never up to the present time attempted to create a business for cooking apparatus.

The burners and oven, specially designed, are patented in all details, and are the same precisely as we have now in daily use. They are both simple, cheap, and within the capacity of an ordinary servant. The actual cost of gas cooking is about the same as that of coal, but the absence of gas for cooking in our own house would entail, in labour and dirt, at least an extra servant and a greatly-increased wear and tear in cleaning. For 18 years our cooking has been done on a table under the kitchen window. The oven and three boiling burners are all the apparatus necessary for 6 to 14 people. The smaller oven and two boiling burners are sufficient for small families.

Many who have this arrangement in use will soon forget the taste of cold food and warmed-up messes, as the cooking for the day is done with so little trouble that the exact requirements for the day will only be prepared for.

The oven is fully hot in less than one minute. To work the whole of the burners and the largest oven at their fullest power all at once requires a ¾ inch gas supply pipe and tap, which can in almost every case be fixed by a plumber for a few shillings. In case of removal, the pipe can be taken and refixed in a new house with little expense. Our own fittings have travelled through four houses in 18 years.

The oven is the most important point; underneath the burner small joints of meat, fish, potatoes, apples, &c., can be roasted perfectly, and toast quickly made. In the lower oven, pastry can be baked quickly and perfectly, and meat can be roasted, not baked as in an ordinary oven. In the upper oven, meat can be stewed, custards, rice puddings, &c., made, and the hundred odd things done which are so constantly required. This upper oven is not fitted to the small size apparatus, and is not necessary in the ordinary cooking for small families.

With regard to the system by which the oven is heated, the burner is at the top of the lowest part, where the gas is perfectly burnt, thereby heating the bottom. The burnt air is taken in at the sides and carried up round the food as a hot jacket; the same thing is done again in the upper oven.

By this system fish can be cooked underneath joint or fowls, and pastry, all at once with one burner, without the slightest alteration in the most delicate flavours. All are as perfect as they can be, and by this system the consumption of gas is reduced to less than one-half what is usually burnt, whilst any character of heat, dry or moist, quick or slow, can be got instantly without trouble.

The boiling burners are Fletcher's patent cooking burner, mounted on a tray in such a manner that the whole can be taken apart in a minute, and cleaned or washed. The joints are made with short lengths of india-rubber tubing for the convenience of servants, but they can be supplied with screw couplings to order, without extra charge.

The burners give the highest duty ever obtained for the gas consumption, and all parts are simple standard patterns, and interchangeable.

The boiling burners are two sizes. the largest, whilst at its fullest power, will burn 25 cubic feet of gas per hour, is for large pans and quick heating. It will boil quickly four or five gallons of water for children's baths, and will, when required, keep a small pan boiling steadily by simply turning the gas low. The small burners at their fullest power burn 10 cubic feet of gas per hour, and are for general work It is advisable to use the large burner only, as far as possible, for very large or very small work, as it is not so ecoconical as the small burners for medium work, although the difference is not great. As soon as boiling heat is reached, turn the burners low; about 2 feet of gas per hour will keep a pan boiling.

Pans and Kettles. — The stamped wrought iron pans of Hopkins and Co., and copper or tin kettles, are strongly recommended as the best for gas cooking. It does not pay to use cast iron pans and kettles.

Smoothing irons can be quickly heated on one of the small burners.

Instructions for Oven.—Hold a light near the tube running crossways under the oven, and turn on the gas. If, by accident, the gas ignites at the jet in the open end of the tube, turn it out, and light again until a line of greenish blue flame is seen under the oven. A good gas supply is quicker and cheaper to use than a poor one, and is also necessary to do first-rate pastry. At its greatest power it requires about 16 feet of gas per hour, but for roasting meat only half this is necessary.

Mr. Paul Crippen, of Bronson, Mich., has patented a *waterproof paint compound*, consisting of alum, coal tar, and sulphur boiled together.

A NEW ROCK DRILL.

THE skill of a great many able mechanics and engineers, and a great deal of capital, have been employed in simplifying and perfecting machinery for drilling purposes, the principal object being to avoid breakages, which are far too common in the ordinary machines It has been found by actual observation that where any great amount of work is being done it requires six drills to accomplish what should be done by four on account of the loss of time occupied in repairing broken parts.

In former machines the parts most liable to breakage were the valves, and as no modification of their construction has been sufficient to give them a durability which compares with that of other parts of the engine, the difficulty in many cases seems irremediable, and the only recourse is to have a sufficient supply of duplicate parts on hand to be ready for emergencies.

Notwithstanding the many failures, mechanics and engineers, appreciating the immense benefits to be derived in cases of success, have pluckily continued with their experiments. As valves could not be made sufficiently durable, the line of experiment naturally tended in the direction of valveless engines. These were known to be perfectly practicable in some respects, while in others, more particularly in the displacement of the compressed air or steam at the ends of the cylinder at the termination of the stroke, and giving a cushion for the piston to prevent severe concussion with the cylinder heads, the problem has remained unsolved till now.

Mr. S. G. Bryer, of Saugus, Mass., who has had an experience connected with rock of over ten years, after much experiment has devised the only thoroughly practical valveless engine for a rock drill yet made. The piston of this drill is its own valve, thereby dispensing with the small valves and their consequent wear and breakage, together with many other small and weak parts common to other drills. As will be seen by reference to the engraving, it has fewer parts than any other rock drill in the market. Practically there is nothing but the cylinder, the piston, and the rotatory motion, which is perfectly simple and scarcely exposed to wear or breakage The blow delivered is as positive and effectual as that from any other style of drill—a result which has never before been obtained with a valveless engine.

The advantages of this drill consists in such an arrangements of parts as to entirely obviate the use of tappets, valves, or other other auxiliaries depending for their action upon percussion, while it is a perfectly effective and smoothly-working machine, free from liability to accident. It is sought to reduce it to the smallest number of unexposed parts, and so to simplify them that they can be easily repaired or duplicated and be interchangeable.

In the upper portion of the sectional cut, midway between the centre and either end of the cylinder, are two annular grooves; these are connected on the back by a passage way, forming a steam chest, to which the supply pipe is attached The exhaust port is located in the centre of the cylinder. In the piston head are two grooves, which also pass entirely around, corresponding in width to those in the cylinder, distant from each other half the space of the latter from the exhaust port, in the right-hand portion of the piston, extending from the grooves in the same to either end, is shown a passage way for steam. In the lower part of the cut is what is termed the cushion valve, its lower end resting upon the lower head of the valve chamber. The valve is cylindrical, and reduced in size, between the ends and middle, to admit of free passage of steam to the exhaust ports of its chamber.

From this description, the operation of the drill can be easily understood. The steam forms a cushion at the end of each stroke, which prevents the piston from knocking. To the upper head of the cylinder is secured the usual device for rotating the piston and drill, consisting of a rod with spiral flutes, entering a socket in the piston head.

The improvements embodied in this drill secure a larger percentage of useful effect, with the least supply of steam, the utmost expansive power of the same being utilized by its peculiar construction; and since no part strikes another to give it motion, the wear is insignificant The inventor has displayed great skill in locating the control of the piston's action within itself, thus rendering the free and perfect operation of the drill wholly independent of auxiliary appliances. The drill may be operated equally well by the use of compressed air, and is absolutely non-freezing.—*Scientific American*

SPAGNOLETTI'S FIRE ALARMS

THIS invention, recently patented by its inventor, C. E. Spagnoletti, the eminent telegraph engineer, consists in a system of electrical fire alarms. In order that the chief department or local district depots may be early advised of the locality in which a fire may break out, the inventor employs a train of clock work to run off paper ribbon similar to a Morse telegraph instrument This train of clock work is automatically started into action by the same current that sends the signal from the place the alarm is given It can also be made to stop automatically, or it can be stopped by the attendant after seeing what station has given an alarm. The instrument has an indicator on it, and shews when it requires winding up; in addition to this a key for sending a current to any outlying station is attached for acknowledging the signal or signals. A bell is also attached, which is made to ring when winding up is required, so that if neglected to be seen it can be heard Another bell, or bells, is also attached to call attention when an alarm is given. These bells may be of the trembling bell system; but I attach to them an earth connection for the bell hammer to work on, so as to discharge the line wire, and thus have any number of bells on one wire, which without this arrangement cannot be done.

The signal given, denoting a station sending an alarm, is given by a code of letters or ciphers. These signals are sent in various ways: first, by turning a wheel on which certain metal projections are placed, to rub in contact with a spring, and thus make letters or ciphers required, indicating the station from which sent. This wheel may be turned by hand or clockwork. If a return signal is required, or an acknowledgment, this is done by a second wheel with a metal projection resting on a spring, or *vice versa*, after the completion of a revolution giving the station's signal letter or cipher. Secondly, a stroking board for sending signals is used. This is a piece of wood, or other insulating material, with pieces of brass or other metal let into it or placed on it in such positions as to make the required letters or ciphers. This is connected to the line wire or earth, and a metal brush is connected to one or the other (earth or line), only to the reverse of the one the board is connected to, and by stroking the brush over the pieces of metal the letter or cipher is sent to the instrument at the station requiring to be signalled to. If a reply is required, the brush is put into a socket to which a bell is connected to earth and a current sent by the key or button from the station, acknowledging the signal. Thirdly, by preference, a box is used with graduating slopes or planes, covered, or partly covered, with metal or wire, so arranged that a metal ball, ring, or wheel will gradually roll down these slightly inclined planes or slopes, and in order to arrest its speed even stages are provided here and there. As the ball, ring, or wheel follows its course and runs over the metal lines it joins one to the other through itself, and thus completes the circuit. The metal being at required intervals insulated (or terminated in certain sections), the ball ceases to make contact when passing over these portions, and thus any signals required can be sent. The ball following its course can be made to repeat any number of signals, or a signal any number of times; or the ball can be made to press down light springs as it travels, the springs making contact as required. On the ball terminating its course it rests on pieces of metal, and connects (if required) a bell for the acknowledgment signal from the station the signal has been sent to, so that the simple act of dropping this small metal ball into the box starts the instrument at the station. records the letter or the cipher of the station sending the signal any number of times required, rings a bell to call attention at the far end signalled to, and finally connects up a bell for the return or acknowledgment signal.

One line wire is all that is required, but with two a system can be arranged by which all outlying stations can be signalled to, giving notice where a fire is, so that if any station signalling to the head office of the district that a fire has broken out, the head office can send to all outlying stations, and advise them where that fire is and where they are to go to. This is done by an audible or other signal.

One instrument is sufficient for any number of out-lying stations, but by having less stations on one, and using two or more, it may be found more convenient. One battery is required for the instrument, and one may be used for the bells. When the system of sending between all stations is adopted, this can be arranged by multiplying the apparatus

THE AMERICAN SCIENCE ASSOCIATION.

OUR esteemed contemporary, the *Scientific American*, thus reports the proceedings of this association :—

The early promise of a large and, in the fullest sense of the word, popular meeting was amply fulfilled. Nearly a thousand members were registered; 595 new members and 45 fellows were elected, among them Mrs. E. A. Smith, of Jersey City, the first lady thus honoured. The number of papers entered was 280. A very active interest was manifested in the proceedings throughout, and the hospitality of the people of Boston and the surrounding towns was unbounded. Boston and its vicinity are rich in institutions, manufactories, pleasure resorts, and points of historic interest, and not a few of the members found these sources of pleasure and profit unsurpassed even by the regular proceedings of the association.

Comparatively few papers were read before the general sessions, the attendance being so large and the number of papers so great that most of the work was done in the sections and sub-sections. In view of the increasing size of the annual gatherings the committee on membership reported in favour of extending the scope of the association, recommending that instead of two sections with sub-sections, as at present, the association should have eight as follows :—

A—Physics. B—Astronomy and Pure Mathematics. C—Chemistry, including its applications to agriculture and the arts. D—Mechanical Science. E—Geology and Geography. F—Biology. G—Anthropology. H—Economic Science and Statistics. It was also recommended that there may be a permanent sub-section of microscopy, which shall elect its own officers, and be responsible directly to the Standing Committee, and that the Sectional Committee of any section may, at its pleasure, form one or more tem-

porary sub-sections, and may designate the officer thereof. The report will be acted upon at the next meeting.

Among the other reports of special committees two were of general interest. The report of the Committee on Science-teaching in the Public Schools has already been noticed. The committee to memorialise Congress and State legislatures regarding the cultivation of timber and the preservation of forests recommended a law to protect trees planted along highways, and to encourage such planting by deductions from highway taxes; also the passage of a law that shall exempt from taxation the increased value of land arising from the planting of trees where none were growing to such period as may appear proper, or until some profit may be realised from plantations; by appropriations of money to agricultural and horticultural societies, to be applied as premiums for tree-planting, and for prizes for the best essays and reports upon subjects of practical forest culture; by encouraging educational institutions to introduce courses of instruction having reference to practical sylviculture; by laws tending to prevent forest fires; by imposing penalties against wilful or careless setting of such fires, and enlarging and defining the powers of local officers in calling for assistance and in adopting measures for suppressing them; by establishing under favourable circumstances model plantations; by the appointment of a Commission of Forestry under State authority analogous to the Commission of Fisheries.

The cable message to the British Association received a cordial answer returning thanks therefor. A message of congratulation was also sent to the venerable M de Chevreul, senior member of the French Academy, on his 95th birthday.

The officers elected for the next meeting, in Cincinnati, to begin August 17, 1881, are—President, Professor G. J. Brush, of New Haven; Secretary, Professor C V. Riley, of Washington; Treasurer, Professor W S Vaux, of Philadelphia; President of Section A, Professor A M Mayer, of Hoboken; Secretary, Professor John Trowbridge, of Cambridge; Vice-President of Section B, Dr. George Englemann, of St. Louis; Secretary, Professor William Saunders, of Canada; Auditing Committee, Professor Henry Wheatland, of Salem, and Professor Thomas Meehan, of Philadelphia.

In the permanent sub-section of Chemistry, Professor William Ripley Nichols, of Boston, was elected Vice-President, and Professor H. W. Wiley, of Lafayette, Ind., Secretary In the permanent sub-section of Anthropology, Colonel Derrick Mallory, of Washington, was elected Vice-President, and Judge J. G. Henderson, of Winchester, Ill., Secretary. A resolution providing for a social reunion of the sections on the second evening of future meetings was adopted.

As already remarked, the most of the papers were read in the several sections and sub-sections. It would not be possible within the scope of this article even to mention them all by title. A few of those of most general interest may be noticed. In Section A (Physics) Professor A M. Mayer described the construction and use of the topophone. Professor A. Graham Bell presented his new invention, the photophone. Mr. A. P Dudley, of New York, read a practical paper on "Transportation Expenses and their Reduction," and gave the results obtained by his invention, the dynograph, designed to test questions in regard to the economical handling of railway trains. This instrument shows that on ordinary roads it is more economical in fuel to run freight trains from eighteen to twenty miles per hour than at ten or twelve. It shows the largest types of engines to be most economical, hauling greater loads per pound of coal, reducing the ratio of train expenses per ton carried. Also, that the dead weight per car, per ton capacity of freight, should be reduced to the lowest limit consistent with safety, as it costs proportionately more to haul empty cars than loaded ones.

Mr. Wm. H. Ballou, of Chicago, read a paper on the "Mississippi River Improvement System." A hint of the magnitude of the problems involved was given in the shifting of the course of the Mississippi at Cairo, Ill., a mile in one year. Still more remarkable than this are the operations of the Missouri River. At one time Council Bluffs enjoyed its presence in immediate proximity to the city and the benefits of its commerce, in consequence of which the city became the terminus for the Western railways in preference to Omaha, three times its size. These railroads erected depots and stationed the offices of the general Western superintendents here. The Union Pacific road constructed an immense bridge here, and in common with other railways built a union depot at Council Bluffs No sooner had this work been completed than the Missouri performed the unexpected feat of moving its channel over to Omaha, three miles away

Mr. E B. Elliott, of Washington, read a paper on "Electric Lighting as applied to Large Areas," Mr. C J. H. Woodbury one on "Friction and Lubricating Oils;" Professor B. F. Hedrick, of Washington, on "Patent Laws as a Means for the Advancement of Science" Of scientific papers less obviously bearing upon practical affairs the number was large—too large for their reviewing here.

In the sub-section of Chemistry a valuable paper on "Laws Governing the Decomposition of Equivalent Solutions of Iodides under the Influence of Actinism" was submitted by Professor A. L. Leeds, of the Stevens Institute Professor A. A. Breneman, of Cornell University, exhibited samples of common stoneware, hitherto decorated only in blue, on which he has been able to obtain a wide range of colours On one specimen vase a vine in green was painted upon the ordinary grey body of stoneware This cheap ware may in this way be made the basis of a new process of underglaze decoration in which the entire piece—colour, glaze, and body is completed at a single burning The theory of the new process rests upon the thickness and comparative impressibility of the glaze. A note on "Water Analysis" was read by the same gentleman.

Mr. H. W. Wiley, of Lafayette, Ind., read a practical paper on the "Manufacture of Glucose." Professor S B. Sharples showed a method of testing sugar and molasses; Mr. E. T. Cox discussed the "Oxide of Antimony found in Extensive Lodes in Sonora, Mexico;" J. C Kleinschmidt read a paper on Foreign Substances in Iron;" and Professor T. Sterry Hunt one on the "Genesis of Certain Iron Ores."

Section B (Natural History) gave evidence of great activity in this field of science. The subject of "Biological Development in the Animal Kingdom, as Manifested in the Paleontological and Embryological Study of Sea Urchins," was illustrated at great length by Professor Alexander Agassiz; and Professor A Hyatt found a practical illustration of the "Theory of Evolution in the Transformation of the Planorbis." Incomplete adaptation, as illustrated by the "History of Sex in Plants," was treated by Mr. L. F. Ward; and the "Evolution of Parasitic Plants," by Mr. Thomas Meehan. Dr. S. V. Clevinger submitted a less popular communication on the "Plan of the Cerebro-spinal Nervous System." The "Economic Aspects of Natural History" were touched upon by Professor T. J. Burrill, of the Illinois Industrial University, in a paper on the microscopic cause of "fire blight" in pear trees and "twig blight" in apple trees. Also by Professor Riley in a paper on the "Cotton Worm;" and by Mr. A. J. Cook, who described two new methods of fighting injurious insects. The papers in the sub-section of Microscopy were chiefly such as were of interest solely to the specialists of that department.

The papers in the sub-section of Anthropology were many and rich in curious information. "The Ethnology of Africa" was discussed by Professor A. S. Bickman. The Myths, Folklore, Language, and Games of the Iroquois Indians were learnedly discussed by the only lady fellow, Mrs. E. A. Smith. Colonel H. B. Carrington read an intesting paper on the "Dakota Tribes." Judge Henderson described the textile fabrics of the ancient inhabitants of the Mississippi Valley. In explaining the textile art among the mound-builders and other ancient American aborigines, he showed that the modern Indians and these ancient people are bound together by a similarity in instruments and processes of spinning and weaving. The material used was the bush of various trees, nettle, and the hair of the bear, buffalo, deer, and dog. In working up vegetable substances, the bark was first macerated, and, after being dried, it was spun in a multitude of ways. The rudest process was rolling on the thigh. The next improvement was a rude spindle, which passed through various processes of evolution to the modern spinning wheel. The gradations of elaboration through which the loom has passed were illustrated by a series of drawings, collections of raw materials, and models of spindles and looms.

Mr. William McAdams described the agricultural implements of stone anciently employed by the natives of the same region, and Mr. W Putnam spoke of the conventional ornamentation of ancient American pottery. In a paper on ancient quarries of Oriental alabaster and flint in the West, Rev. H. C Hovey described and illustrated by maps, diagrams, and specimens, some remarkable discoveries made by him in Wyandotte Cave, Indiana Professor E. S. Morse gave an instructive account of his investigations among the shell heaps and caverns of Japan.

In the subsection of Geology Mr. N. H. Winchel read a paper on "Capriferous Series in Minnesota," and Alexis A. Julien gave a description of the excavation of the upper basin and clove of the Kaaterskill (Catskill) Mountains. L. W. Bailey reported the progress of the geological investigations in New Brunswick in 1879 and 1880, and was followed by H. C. Lewis, upon the "Tertiary Age of Iron Ores of the Lower Silurian Limestone Valleys." Professor Silliman spoke upon the turquoise localities of Los Cerillos. Other contributions to this subsection were:—"Granites in the White Mountain Notch upon Mount Willard and their Contact Phenomena," by George W. Hawes; "Eruptive Rocks of Mount Ascutney," by Professor C. H. Hitchcock; "Coals of Galisteo, New Mexico," by Professor B. Silliman; and "Auriferous Gravels of the Upper Rio Grande in New Mexico," by the same.

RECENT AMERICAN AND FOREIGN PATENTS.

An improved match box has been patented by Mr. George Wenström, of Stockholm, Sweden. It is provided with a sliding cap or inner box, which is divided into two compartments—one for holding matches and the other for receiving the end of the cigar for lighting—and formed with a slit at one side for the insertion of a match within the lighting chamber; also, in a tongue formed on the inner box, which, in connection with an opening in the outer box, forms a cutting device, combined with a chamber formed at the inside of the match box to receive the cuttings.

Grinding Mill.—An improvement in mechanism for mixing and feeding material to the stones of a grinding mill, whereby the action of the mixing and feeding devices is rendered uniform, one being started or arrested at the same time with the other and operated at the like rate of speed, has been patented by Mr. James Lowell, of Purcellville, Va.

An improvement in stove boards has been patented by Mr. A. Irving Griggs, of New York city. The invention consists in constructing a stove board made with a bead and a hem, and having the lower ply of the hem corrugated, and its edge turned up against the plate within the cavity of the bead, and the veneer cemented to the lower side of the middle part of the plate.

Messrs. Marshall J. Allen, of New York city, and William E. Bradley, of Frankfort, Ky., have patented an improved process of *saving the sugar and starch* contained in a waste product *in the manufacture of whiskey* and utilising it. The process consists in freeing the slop from the bran, chaff, and coarse particles of grain, and introducing the liquid thus obtained in place of water in the succeeding operations with fresh grain.

An improved ironing machine has been patented by Mr. John Socias y Rubio, of New York city. This invention is an improvement in the class of machines in which the sad iron is suspended and adjusted vertically by a screw, and is designed to provide means for suspending a sad iron which will allow it to be moved in any direction over the ironing table; also, to suspend the sad iron by yielding or elastic devices, to enable it to be operated easily and efficiently.

Mr Benjamin F. Sherman, of Ballston Spa, N. Y, has patented an improved *hydrocarbon furnace*, having the bottom of its combustion chamber made with a series of longitudinal pockets containing asbestos or analogous absorbent material, with perforated oil pipes embedded therein, and with alternating air chambers rising between said pockets and communicating below with the portion of the furnace corresponding to the ash pit, the said air chambers being perforated at the top and surmounted by inclined hoods or sheds which deflect the currents of air down upon the surface of the saturated asbestos.

Mr. Louis Graf, of Van Buren, Ark, has patented a process for producing *coloured photographs* on linen or analogous material, which consists in the employment of a collodion mixture consisting, essentially, of distilled water, nitrate of silver, absolute alcohol, chloride of calcium, citric acid, and ordinary collodion.

An improvement in the class of *planters* having reciprocating seed slides, with which auxiliary devices are combined to assist in regulating the discharge of seed, has been painted by Mr. Leonhard Grieser, of Minonk, Ill. The invention consists, mainly, in the employment of a curved reciprocating block or bar, which is located in the hopper and attached to the seed slide, with which it reciprocates simultaneously, so as to alternately open and close one of the two adjacent openings, and thereby alternately permit and prevent the escape of seed through the openings.

Mr. W. I. Wooster, of Harvard, Ill., has patented an improved *blind fastener and slat operator*, which consists of a slotted strip of wood or metal fixed vertically on a side of the blind and connected with each blind slat, said strip of wood or metal being moved vertically to open or close the slats and to bolt the blind by means of a rod that passes through the window frame.

An improvement in umbrellas of that form in which some of the ribs are longer than the others, or in which the staff is connected eccentrically to the cover, to allow the person to occupy the centre of shelter and be better protected from rain or the sun's rays has been patented by Mr. Alexander H. Ege, of Mechanicsburg, Pa.

A compound rotary and reciprocating churn in which is employed a rotary dasher to whip the milk, in combination with a reciprocating dash to displace the liquid, so that the entire liquid contents of the churn may be quickly and continuously presented to the action of the rotary paddle or dash by the movement of the reciprocating dash, has been patented by Mr. Andrew Mearns, of Tolesborough, Ky.

Waggons.—Mr. Joseph C. Fowler, of Arcola, Texas, has patented an improvement in running gear for waggons. The improvement relates to king bolts and coupling devices for connecting the forward axle of waggons, carriages, and other vehicles, and it consists in a king pin or bolt which passes in the bolster through braces and enters a socket in the top bar of the axle, where it is held by a cross pin, the bolt and braces thereby sustaining the weight. The lower end of the bolt is formed as a rounded bearing in a direction transversely of the vehicle, so that the forward wheels and axle may conform to the ground without effect on the waggon body

An improvement in pipe couplings has been patented by Messrs. David B Hand and Ephraim H. Reitzel, of Columbia, Pa This invention particularly relates to a means for connecting the heating pipes between the cars of a railway train, but is also applicable to other purposes It consists in a novel construction and arrangement of coupling devices, whereby provision is made for affording a universal motion to the pipes.

Mr. John Collins, of Brooklyn, N. Y., has patented *apparatus for generating gas for mineral waters* This is an improvement in that class of carbonic acid gas generators in which the discharge of acid into the chamber containing lime or other carbonate is regulated automatically by the variation in the pressure of gas, which acts upon a piston that, in turn, tilts a pivoted lever, and thereby opens a valve that controls the escape of acid from its tank or holder.

An improvement in *gates* has been patented by Mr. Robert M Grier, of O'Fallon, Mo The objects of this invention are, first, to prevent the trouble arising from sagging of gate posts; second, to provide for widening the gate entrance when an unusual width is required; and, third, to furnish a gate of durable construction and requiring but a small quantity of lumber for its manufacture.

An improved *measuring pump*, designed to draw out all the fluid from a barrel, and to correctly measure molasses, oil, or any other liquid, and to dispense with oil tanks, measures, funnels, and tapping devices, has been patented by Mr. Fradelshon Harris, of Rockport, Ill.

An improvement in the class of *pendulums* designed for use in connection with clock requiring compensating pendulum has been patented by John W. Hile, of Leavenworth, Kan. This improvement consists in the construction and arrangement of parts, whereby the bob or weight is adjusted up or down automatically to compensate for changes in the length or extension of the pendulum due to changes in temperature of the surrounding air or adjacent surfaces or objects.

Mr. Perry A. Poer, of Comstock, Mich., has patented *a hinge*, peculiarly adapted to a V-shaped harrow. When it is desired to uncouple the two sections of the harrow, one of the sections is allowed to lie flat on the ground, and the other is raised to about a vertical position, and it may then be readily detached.

Mr. John O. Grisham, of State Line, Miss., has patented *a corn cutting and grinding mill*, which is an improvement upon the form of corn crusher in which the ears of corn in the husk are fed through throats, sliced into sections by revolving knives, and these sections then rendered fine by passage between grinding surfaces. The invention consists in combining with the feeding throats and knives, a set of spring seated tables, which hold the ends of the ears of corn while being cut, and which allow the sections being cut off to press down to accommodate the thickness of the knife, thus preventing the knife from hanging in the ear, and rendering the cutting action easier.

Mr. Isaac S. Schuyler, of Brooklyn, N. Y., has patented *a machine for cutting screw threads*. The improvements relate to machines for cutting screw threads on pipes and couplings, internally and externally, and are designed to accomplish such work more rapidly and perfectly than has hitherto been done. Rotary cutters formed with serrated edges are employed. The arbors of the cutters are fitted in a revolving head that has an endwise motion proportioned to the pitch of the screw, so that while the cutters rapidly revolve with their arbors they also travel in a spiral path upon the surface being operated upon

Mr Charles G. Trafton, of Slatersville, R.I., has patented *a thread guide for spooling machines* that is self-adjusting to the yarn as the latter runs from the bobbin to the larger spool, so as to avoid friction. It consists in a guide plate provided at one end with a curved friction service and at the other with a slotted flange and a plate, in combination with a rod having projections at its top to limit the movements of the plate sidewise and a screw which serves as a pivot for the plate.

Mr. James H. H. Taylor, of Lawrence, Mass, has patented a mechanism for *stopping and starting street cars*, so constructed that the momentum of the car can be used for stopping the car, stored up, ond again used for starting the car,

Mr. George Stemson, of East Chester, N. Y, has patented an *improved leg for bedstead frames*, which furnishes to the bed an elastic support. The leg is formed of flat curved springs, and a spiral spring placed in a box, the whole being supported on castors.

Mr. Frederick A. Baker, of Brooklyn, N, Y., has patented a *fire escape ladder* for the use of firemen. It can be readily secured to the windows of buildings from story to story to form a fire escape.

Improvements in *electric burglar alarm for safes* have been patented by Mr. Edwin J. Leland, of Worcester. Mass. These improvements relate to burglar alarm telegraphs connected with safes, vaults, and similar places, and arranged to give a signal at a central office in case the circuit is broken or the wires tampered with. Such lines usually have combined with them a galvanometer, so that any change of resistance caused by an attempt to put a loop in the line, and thereby cut out a safe or vault without breaking circuit, or from any cause, shall be indicated by the galvanometer. The object of this invention is to provide means for testing the line at any time and determining whether the safe or vault is in circuit, so that it will not be necessary to make a personal inspection of the vault or safe every time the indicator shows a change of resistance or the signal is operated, as such effects are often produced by crossed wires and electrical disturbances in the atmosphere.

A bottlestopper has been patented by Mr. Thomas G Austen, of Oswego, N. Y. This invention relates to that class of devices that are designed to close the mouth of a bottle and yet to permit the gradual ejection or sprinkling of its contents.

Mr. Joseph T. Maybury, of Mobile, Ala., has patented a process of *canning oysters*, which consists of placing them in cans and pouring over them a hot mixture composed of water, salicylic acid, and vinegar, in the proportions of about ten gallons, one and six-tenths gill, and one-half gallon respectively, and then closing the cans and placing them in boiling water for a short time.

A novel skylight bar, in which provision is made for collecting the condensed moisture which accumulates on the interior surface of the glass and conducting it to the roof, has been patented by Mr. Fred Ruemping, of Kansas city, Mo.

A well casing, which is simple and effective, has been patented by Messrs. Henry Shear and Henry M. Toomey, of Arcola, Ill. The invention consists in a well and eistern casing formed of a number of segmental sections of earthenware or burned clay, provided with tongues and groves at the ends and with strengthening ribs on the inner sides.

A trunk fastener patented by George A. Sofield, of Jersey City, N J., consists in the combination with a bolt tongue having a transverse groove of a socket provided with a lodgitudinal groove to receive the bolt, and with a transverse groove containing a spring latch fitting into it and catching into the transverse groove of the bolt tongue.

Mr Carey Inskeep, of Ottumwa, Ia., has patented an *improved hairpin*, which is so so constructed that it cannot become detached accidentally, but may be inserted and removed without disturbing the contiguous hair further than requisite to allow space for the body of the pin.

Mr. Benjamin Le Coultre, of Geneva, Switzerland, has patented a *chronograph* having both second and minute hands indicating on one dial and mounted on the same arbor The inventor fits upon the central arbor of the watch a loose sleeve that carries the minute hand and a driving wheel, and outside of this fits a second loose sleeve carrying the second hand and a driving wheel. Upon a lever fitted for movement by a ratchet wheel in the usual manner are fitted the wheels that operate the second hand from the centre pinion when moved into gear, and upon a pivoted arm that is connected with the lever is a pinion that connects a fixed pinion on the centre arbor with the driving wheel of the minute hand The driving wheels of both the second and minute hands are fitted with heart cams that are acted upon by a T-arm to bring both hands back to the starting point. By this construction a simultaneous action is obtained on both hanes—first, to set them in motion, second to arrest them; and, third, to turn them to the starting point

An improvement in whiffletrees has been patented by Mr. Ferdinand O. Fischer, of Aptos, Cal. The invention consists in combining a lever spring, shouldered bar, and slide bar having end disk, with the end of a whiffletree.

Messrs. Carl P. Cullmann, of Idar, and Carl A. Lorenz, of Oberstein, Germany, have patented a process of *manufacturing onyx stones from agate*, by immersing one side in a bath of dilute nitric acid and iron, the other side in a bath of carbonate of potassa and water, and then drying the stones on a stove, and burning them to fix the colour.

Mr Carl J. Renz, of Hudson. N. Y., has patented an *improved process of preserving fruits*, and more particularly grapes, pears, strawberries, and other fresh whole fruits without the use of a mother liquor. It is an improvement in that general process of preserving in which the air is first exhausted from the receptacle in which the fruit is placed, and in which the gases subsequently evolved by the fruit are taken up by an absorbent. The improvement consists in deodorizing and absorbing the condensable gases by a block of quassia wood or other material impregnated by quassia.

Mr Israel V. Ketcham, of Brooklyn, N.Y., has patented an improvement in *milk pails* used by dealers for delivering milk in small quantities to consumers. The object of the invention is to furnish a self-measuring pail from which a regulated quantity of fluid shall run at each inversion of the pail.

A combined *door plate and letter receiver*, patented by Mr. Henry Free, of Lewiston, Me., is so constructed as to keep rain, snow, wind, and cold from entering the opening in the door, and it will allow the name or number to be readily changed.

An improved *book holder*, which is simple, effective, and convenient, has been patented by Wilhelm F. Eppler, of Herrstein, Germany. It is formed of a box, for lunch and other articles, and of two boards, between which the books are placed All the parts are held together by cords attached to a slate placed below the lunch box or to the box itself, and are wound upon the revolving handle of the book holder.

Mr. Benedict Boehler, of St. Louis, Mo., has patented a *lumber polishing machine*, which is more particularly intended for polishing thin lumber, such as is used for making cigar boxes, and for similar purposes It consists in a novel arrangement of a stationary bed-plate and a tightly journaled cylinder, whereby provision is made for simultaneously polishing both sides of the work as it passes through the machine.

THE BENEFITS OF VIVISECTION.

The "Popular Science Monthly" gives a neat summary of Dr. Charles Richet's arguments in defence of vivisection. He demands that it shall be judged by its practical results, and claims that if it can be shown that we have gained by this method of experiment the means of curing one or two diseases of man it must be considered legitimate. He cites a number of discoveries made through vivisection. Among them is the discovery of the circulation of the blood. "Galen established the fact that the arteries contained blood by observations in the artery of a living animal. Harvey opened the chests of living animals, cut into the pericardium, observed the contraction of the heart, and what was going on in the veins and arteries, and deduced from what he saw his theory of the circulation. Transfusion of blood, an operation resorted to in extreme cases with the best results in saving life, was introduced after its possibility had been ascertained from experiments upon animals first made in 1664 by Lower and afterwards by Denis. 'Experiment alone,' Dr. Richet says, 'will teach us precisely what quantity of blood is necessary and what is harmful; and if over sensitiveness forbids animal suffering for this end, then the experiments would have to be made on human beings' The mode of death from the inhalation of carbonic oxide, and correlatively the method of avoiding or preventing death from inhalation, have been made known only through vivisection. So also 'all that we know in hygiene of the quantity of air necessary to support life is the result of experiments on dogs and rabbits. Sometimes a precise knowledge of the conditions of respiration has served to prevent men from perishing.' Only two methods exist by which we may learn the conditions of gastric digestion and collect its secretions, viz., by observation of gastric fistulæ produced by chance in man, and by artificial fistulæ in animals. The first method has been possible only in three or four instances, but the effect of food on the gastric secretion in dogs and cats has been largely observed; and the knowledge of the remedies which have been applied to the relief of dyspepsia has been derived from such studies. Our knowledge of nutrition has been largely added to by means of experiments in which dogs and cats have been submitted to varied alimentation, and from which the quantity and quality of food necessary to sustain life have been deduced. What we know of the nerves has been gained from studies of animals, as have also the means of relieving neuralgias and paralysis, in which, thanks to the scientific analyses of the vivisectors Fritsche, Hitzig, and Ferrier, 'we can pass from the effect to the cause, and assign to paralysis a central lesion at a well-determined spot, so that trephining at the spot may cause the paralysis to disappear. The experiments of Galvani and his followers on frogs have taught us to estimate the effect of the electric current on nerve and muscle, and shown us how to apply galvanisation to the prevention of the paralysis which ensues from the destruction of the motor nerves. The numerous patients relieved of nervous diseases 'by this admirable therapeutic agent have no call to speak ill of such vivisectors as Galvani, Aldini, Volta, Magendie, Marshall Hall, Remak, Du Bois Reymond, and many others, since it is to their discoveries that the relief of their ills is owing. Would Galvani have made his discoveries had he refrained from dissecting frogs? Would the elecric current have been applied to atrophied limbs if it had not been found that the action of this current in dogs was salutary and not dangerous?' Certain diseases of the urinary organs have been studied in animals. The treatment of sympathetic ophthalmia by section of the ciliary nerves of the deceased side has been shown to be advantageous by experiment, and the results yielded by experiments on dogs and rabbits have been applied to patients The correct treatment of cataract has been similarly learned. Encouraging progress is made by vivisection in the study of the formation of callus, of pseudarthrosis, of osseous grafts, of regeneration of bone by periosteum,—subjects of great importance in surgery. The vaso-motor theory, which plays a large part in the medicine and surgery of the present day, has been established by experiments on the great sympathetic and the rabbit's ear. Dr Brown Sequard has furnished useful ideas relating to epilepsy and tetanus from the results of painful experiments on dogs and guinea-pigs. Trial on animals is useful to determine the action of new medicines, for 'we do not wish to experiment on man at the risk of poisoning him, where animals can be employed,'—so with poisons. Finally, if we deprive *savants* of the right to submit living animals to experiment, we shall go back beyond the days of Galen. 'If all those who have been relieved—verily made to live again,'—says Dr. Richet, 'by modern medicine and surgery could speak, they would confound those who load vivisection with calumny, and they would hold that their own life and sufferings weighed more in the balance than the sufferings of those animals which have been sacrificed in laboratories to the lasting benefit of man.'"—*Journal of Science*

Mr John H. Hodges, of Attleborough, Mass., has patented a separable button, which csnsists in a curved wire catch combined with a cup having a short bevelled end lip and a protruding end, with opposite springs arranged between the side of cup and the curved parts of catches.

An improved blacking brush holder has been patented by Mr. Henry B. Perham, 665, West Lake-street, Chicogo, Ill. The invention consists in securing blacking brushes for transportation or packing in trunks with wearing apparel by an incasing crossbelt, which not only retains them in a compact form, but incases them so as to prevent the surrounding articles from being soiled.

An improved sulky plough has been patensed by Mr. Horace E. Reeves, of Fort Dodge, Ia. The object of this invention is to construct sulky ploughs in such a manner that the ploughs can be readily adjusted and controlled, will be firmly held while at work, and will yield should they strike an obstruction.

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October 20th to November 20th inclusive.

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Screws, Screw Drivers, &c.—W. W. Hulse, T. Cawthron and W. Fearnbough.

Sewing and Embroidering.—J. Warwick, G. Browning and T. Morts, S. and A. Keats, W. H. Dorman.

Ship and Boatbuilding, Ferries.—J. Parlour, B. J. B. Mills (com.), N. Stick, W. Reemey, R. H. Turnbull, T. Cornish, R. and J. Jones, J. H. Johnson (com.)

Signals, Alarms, Communicating Apparatus, Conveying Sounds.—G. Skrivanoff, F. King and G. Green, J. H. Shoebotham, A. L. Warton and J. Dobson, E. G. Brewer (com.), W. Biddulph, W. T. Braham, C. J. A. Nicolet, M. C. and T. J. Denne, F. Harmant.

Syphons.—H. E. Cooper.

Telegraphs; Telegraph Printing Apparatus.— G. Skrivanoff, T. M. Foote, E. George, J. W. Fuller, F. H. W. Higgins, R. Kendal.

Tickets, Labels, &c.—E. A. Pallister, C. Hodges, A. Gorse.

Tilling and Cultivating, &c.—T. Turner, J. Wallace.

Tobacco and Snuff, Cigars, Cigar-Holders, Pipe and Cigar-lighters, Smoking Pipes, Tobacco Pouches, &c.—J. Brindle.

Toys.—W. R. Lake (com.)

Tramways and Tramway Carriages, Tramway Locomotives.—J. Hall, A. Fairlie, P. Burrell and H. Valpy.

Traps for Drains, &c.—J. W. Holland, D, Brown.

Trimmings, &c.—A. G. Duncan (com.)

Turning, Lathes, &c.—A. Muir, W. W. Hulse.

Umbrellas, Parasols, &c.—H. Skerrett, W. R. Lake (com.), G. Lusher, E. Edmonds (com.)

Upholstery.—J. B. Rowcliffe.

Valves, Taps, Stop Cocks, Plugs; Regulating the Flow and Pressure of Fluids.—H. Simon, J. and R. Crighton, and P. Chell, S. Hallam, J. A. Muller, J. Burr, H. J. Haddan (com.)

Velocipedes, Bicycles, &c.—L. O. Michael, W. E. Hart, T. Butler, J. Beale, T. Pritchard, F. Weatherill.

Ventilation: Supplying and Purifying Air for Buildings, Mines, Ships, Carriages, &c.—J. H. Johnson (com.)

Washing, Cleansing, and Wringing Fabrics, Yarns, and Materials.—W. Brierley, C. T. Bastand.

Window Blinds and Sashes.—R. Carlyle.

⁂ *The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.*

TECHNICAL EDUCATION.

The Cutlers' Company announce that being desirous to render further assistance in the development of technical education, or a knowledge of the principles of science as applied to the materials used in the cutlery trade, they have arranged for a course of lectures being delivered, or paper read, at the hall of the company, Cloak-lane, Cannon-street, City, during the present season. It is proposed that the first course shall consist of four lectures or papers upon subjects intimately connected with the materials used in the manufacture of cutlery, and that they shall take place on the following days:— Wednesday, December 1st; Wednesday, January 5th; Wednesday, February 2nd; and Wednesday, March 2. With a view of assisting the company in the objects they have in view, Sir H. Bessemer, C.E., F.R.S., has kindly promised to commence the course, and will, on December 1st, read a paper "On the Manufacture and Uses of Steel, with Special Reference to its Employment for Edge Tools." The company invite the attendance and the cordial co-operation of manufacturers of cutlery, and through them that of their workmen and apprentices. The admission will be free, but by ticket.

Several objects formed from pure massive nickel have recently been submitted to the Société d'Encouragement, obtained not by electro-deposition, but by fusion and forging. Nickel possesses many properties that deserve attention from those engaged in industrial pursuits. For example, it is not liable to oxidation by atmospheric influence, nor under any ordinary circumstances. It is more infusible, malleable, and ductile than iron. These qualities, however, cannot be utilised, because it must be employed pure and under special conditions. If one-thousandth part of magnesium is thrown into the nickel at the moment of fusion, then the metal will possess all the malleability that can be desired. It may be drawn, rolled, or welded, and may be worked in any manner in which iron can be worked.

Reviews.

"London Smoke and Fog: With some Observations on 'the Country Parson's Grate' and other Modern Fireplaces. Being a Chapter from the Author's New Edition of his work on 'The Ventilation of Dwelling-houses and the Utilisation of Waste Heat from Open Fireplaces.'" By FREDERICK EDWARDS, Jun., author of "Our Domestic Fireplaces," "A Treatise on Smoky Chimneys," &c. London: Longmans, Green, and Co. 1880.

THE author states that the substance of this pamplet forms a chapter in the new edition of the author's book on "Ventilation and Heat," where illustrations are given. As attention has recently been called to the subjects of fog and smoke, and as few have opportunities of examining various treatises, it has seemed to the author that it might be of public benefit to publish this in a separate form.

As Mr. Edwards is, without doubt, an authority on stoves, grates, and chimneys, and whether he writes on these or on subjects on which his authority is nil, *ex cathedra* is his style. Therefore our readers must expect to find strong assertion, where they would perhaps expect explanation and arguments What strikes us as curious, however, is the introduction of fog into the title of the pamphlet, because the following remarks in the introductory portion of the work is all we can see that gives any useful information as to fogs:—

The gloom of the winter of 1879-80 was so disheartening, so dangerous, and in each sense of the word so appalling, that on a recurrence of fog just recently, some have asked whether nothing can be done to relieve our metropolis from the pernicious smoke which in certain states of the atmosphere exposes us to a gloom seldom to be found elsewhere on the surface of the whole earth, and utterly unknown in the great cities of past times. Dr Carpenter, of Croydon, has pointed out in the *Times* how we may leave such a place as Croydon with a clear sky and sunshine, and enter gradually an atmosphere that is utterly repulsive. Residents in most parts of the suburbs have had similar experience. The question how we are to deal with the smoke question has therefore been asked. Many answers may be given, but it is probable that not a single answer may be given that could at once be accepted as satisfactory, for the simple reason that it is beyond any man's power to suggest a remedy that could be speedy and complete in its application. As, therefore, it is useless to dream of impossibilities, we must be content to consider the only schemes which have the slightest appearance of being practicable.

One scheme is to warm our houses entirely by gas, but this scheme is met by exceedingly strong objections. The cost is very great, as gas has to be produced from coal, and we have to pay the expenses of manufacture, the expenses of supply, salaries of collectors, measurers, secretaries, and other officers, together with interest on money invested. Next, our houses are so constructed that we have incessant down draughts in some chimneys, rendering it scarcely possible in some cases to use a fire at all, and in all cases of down draught it would be impossible to use gas. We may just as well have a smoky room as a room filled with the products of combustion from a gas stove.

A second scheme is to burn coke or anthacite coal, but these are unfit for open fireplaces, as they are flameless and easily emit offensive products when not burnt in stoves specially constructed for them.

A third scheme is to levy a tax on all open fireplaces, but this is so opposed to our habits that we can hardly conceive a proposition that would be more unpopular.

A fourth scheme is to heat a large number of houses, say 20, 50, 100, or more, from a single source, by means of hot water-pipes, steam-pipes, or heated air, the furnace to supply the hot water, steam, or warmed air, being under the control of a superintending engineer and fireman. The author has discussed the scheme in previous volumes, but the only attempt to carry out the suggestion, so far as he has heard of, has been at Lockport, in the United States, where as many as 200 houses have been heated, supplied with hot water, and heat for cooking from a single source. This plan was described by Mr. George Maw, F.G.S., in a letter to the *Times* some two or three years ago. The difficulty of applying this system to existing houses appears to be overwhelming. It could, therefore, only be attempted in new districts as at Lockport, and by capitalists of good intelligence and enterprise.

A fifth scheme is to heat our houses entirely by hot water, steam, or hot air, having a furnace in the basement, a single furnace chimney, and requiring under penalties that this furnace should be so constructed and used as to consume smoke.

As these schemes appear to afford us no prospect of relief whatever, so far as this great metropolis is concerned, we may turn to a last scheme, which, though it may afford us no immediate prospect of relief, may not be so hopelessly unpromising as the five schemes mentioned above, and be well worthy, therefore, of very serious consideration.

This is the scheme introduced by Mr. John Cutler in 1815, and by Dr. Neil Arnott in 1854, of burning a fire from the top downwards A box below the fire bars is charged with fuel, a fire is made on the top of the body of fuel and the fire burns gradually downwards like a torch or a candle, a poker being used now and then to separate the caking coal and allow air to enter with requisite freedom, By Mr. Cutler's and Dr. Arnott's plan the coal was raised up to the fire bars from a box placed beneath them. By Mr. Young's plan the coal was screwed up into the fire from a trough placed on the hearth in front of the fire. By the present writer's plan a door is pushed down in front of the burning fuel. The author need not go into the question of which is the best mode of carrying out the system. Each one can determine this for himself He need only state what are the unquestionable results known to experienced persons who have used them for twenty-five years. These prove unquestionably that there need be no smoke after a fire is lighted in the morning, and that then only a thin film is to be observed from the chimney above. Also that a chimney in which this grate is used only requires sweeping once in seven years.[?] These two facts appear to be conclusive, and that we ought unquestionably to burn our coal from the top downwards instead of the reverse. The question as to the best appliance for doing it is another matter altogether.

Now as, notwithstanding Dr. Carpenter's assertions, it is not true that the recent prevalence of London fogs was essentially due to the smoke from the chimneys, because fogs were prevalent at times when there were fewer fires (as in June); thus it is clear that the subject of fogs is not to be disposed of by the production of a good stove and chimney.

WINTERING FLOWER ROOTS.—The roots of many useful and ornamental plants, such as cannas, dahlias, and gladiolus, may be safely wintered in dry soil by means of external coverings. But as they do not require light during the winter it is safer to lift and store them in a dry cellar or building from which frost is excluded. We find them to keep best, says an agricultural writer, packed in a soil just moist enough to keep the roots from swelling.

GEORGES PIERSON.

In the untimely death of Georges Pierson, in Paris, lately, France loses a brilliant genius ann a hard working scientific student. Four years ago he commenced a vast series of researches and experiments upon the natural rhythm of many languages and succeeded in discovering and establishing highly important relations, hitherto unknown. between rhythm and melody—*i.e.*, between the rapidity of vocal music and its modulations. These laws once established and systematized, he was naturally led to apply them in elucidation of the fundamental basis of harmony itself, and found that they constitute a new and perfect theory of harmony, without any of the manifold irregularities and exceptions which encumber all previous theories. It amounted, in fact, to the creation of one more exact science, and the world will soon have the opportunity to test the claims made on M. Pierson's behalf by some of the most competent authorities, his work on "The Natural Rhythm of Language" being announced for speedy publication at the expense of the French Government. M. Pierson had gained renown as a philologist in the course of his studies on the philosophy of music, and had been offered a professional chair in the Dutch University of Groningen on the recommendation of Ernest Rénan. He had been employed by the Department of Public Instruction upon scientific commissions in Austria, and had been tendered his Algerian appointment in the hope that the climate of the colony would restore his health, shattered by too constant labour. He died at the early age of twenty-nine years.

THE GOVERNMENT AND THE TELEPHONE.

Is a telephone a telegraph? This is the question which has been exercising the intellect of the Exchequer Division of the High Court of Justice. It is not so very long since the stories that came to England from the United States regarding the achievements of the telephone were set down with a sort of wondering incredulity as belonging most probably to the marvels of American fable; but there is now an Edison Telephone Company of London, and it is against this company that the Attorney-General is invoking the assistance of the law on behalf of the Crown. The Crown contends that the working of the telephone for gain is an infringement of the monopoly possessed by Government for the transmission of telegraphic messages. The Government holds its monopoly under the Acts of Parliament which describe telegraphs as "electric or other telegraphs or mechanical engines," and which define the term "telegraphic" as intended to include any apparatus for transmitting messages or other communications by means of electric signals. Edison's instrument is termed, in the specifications of the Letters Patent, "the speaking or telephone apparatus," "a telegraph operated by sound," "an instrument for transmitting sound by electricity," and so forth. In these terms lies the gist of the legal contention. The Attorney-General comes to Court on behalf of the Crown and says that the messages conveyed by Edison's instruments, which, it is alleged, comprise a wire extending from a sending to a receiving station, are telegraphic messages, and are conveyed by electricity, and that, with these instruments, the mechanical agency is the voice of the person transmitting the message, while in the case of the other telegraphs the mechanical agency is the hand.

The Court which is the arena of this curious contention appears to have been rendered lively by a display of the marvellous machines that have been constructed for the reproduction of the sound of the human voice. The points at issue, though in appearance verbal, are in reality of far more substantial character. The Attorney-General asks the Court in effect to decide that the wires used by the Edison Company are telegraphs, and that the messages conveyed by the wires are telegrams, and that thus the working of the Edison instruments upon any terms under which money or other consideration is paid is an invasion of the exclusive privilege created for the Government by the Act of Parliament under which the Crown acquired the telegraphs. But the company, while replying in particular to the several charges of the Attorney-General, raise what is in truth as large and momentous a question as any that can enter into such a case. Men of science must be left to say whether or no the combination of mechanical appliances and natural forces is so similar in the use of the telegraph and the telephone as to make the two devices for transmitting communications practically one thing; but the issue which is of general interest, and upon which popular opinion can be more easily formed, arises out of the question whether, at the time when Parliament passed the Telegraph Act of 1869, such a discovery as the telephone was contemplated, The defendants in this action urge that it was long after 1869, before any person had conceived it possible that the human voice could be so endued with the power of transcending distance that people might converse together through the aid of electricity when far away from one another.

It is natural to feel a deep interest in a case at once so curious and so significant of immense issues. The busy hands of science are breaking in with great rapidity the forces of nature to obedience to the human will, and in proportion as we learn to convert the elements to our use and to find the history of the many phenomena around us in a few primary powers, it is possible that a conflict of the rights of inventors will arise with increasing frequency. We have a limited knowledge, though we make a marvellous use, of the agency of electricity, and each practical adaptation of additions to our experience of so multiform a force is likely more and more to compete closely, and, at times, indistinguishably, with the contrivances that have forerun it In the present case, whatever may be the decision of the Courts of law, examination will probably reveal considerations of a larger equity which no Government will disregard, and it is not to be feared that Mr. Fawcett would allow any general interests to suffer in his hands, or would be over eager to seek a harsh indulgence of his legal rights.—*Times.*

THE EXPANSION OF STEAM.

By Professor R. H. Thurston.

We quote the following from our contemporary, the *Scientific American*, as giving much information on the above subject in a concise form.

A correspondent writes me asking the following question, requesting me to reply by sending an article to the *Scientific American*, "which," as he says for himself and shopmates, "we all read, and where we shall all be sure to see it : What *is*, really, the proper point of cut off in steam engines to give maximum economy in dollars and cents?"

Some people say one thing and some another. In your History of the Steam Engine, page 475, you say about one-half the square root of the steam pressure is about right 'in general,' and a writer in the *Journal of the Franklin Institute* for June, who ought to understand the matter, says that the steam pressure divided by the back pressure gives the number of times to expand to secure maximum efficiency.

"Now, your rule would give, for a Corliss engine with 90 pounds of steam, a cut-off at one-fifth, while the last would make it one-seventh. Then again, for an old fashioned engine with condenser, cutting off steam at 25 pounds, your rule makes it about one-third, and the other says one-fifteenth or even one-twentieth, which I know by experience cannot be right."

Ans. The point of cut-off giving maximum economy in steam engines is never precisely the same in any two engines. It will vary with every change of type, with every change of pressure of steam, with every difference in piston speed, and even in two engines built from the same drawings and made from the same pattern, the degree of expansion being the same, the two machines will demand different quantities of steam.

Could all the conditions affecting the expenditure of heat in the production of power be made absolutely invariable, the point of cut-off for maximum efficiency could be determined for those conditions—not by calculation, but by experiment; and it would remain the same just as long as those conditions could be maintained absolutely the same. But this never occurs in practice.

Steam enters the cylinder sometimes barely dry, sometimes superheated, sometimes damp with watery vapour, and often mingled with water to the extent of ten or twenty per cent ; it even sometimes carries with it more than its own weight of water. It sometimes comes in contact with hot and nearly dry metallic surfaces, which aid in keeping it in a state of maximum efficiency; but it oftener, in fact usually, meets an interior filled with damp chilling vapours, and surrounden by walls cool enough to condense a considerable part of the steam supplied up to the point of cut-off. During expansion the steam never follows precisely the law of expanding permanent gases—with which the pressure diminishes precisely in the proportion in which volume increases—but, by condensation at first and by re-evaporation later in the stroke, the expansion line falls below at first and then rises above the curve expressing Mariotte's and Boyle's law, although frequently approaching that curve pretty closely. If the engine speed increases the steam is usually less affected by causes producing loss; if the speed decreases a loss of economy generally ensues. Large engines are less subject to such losses than small ones, and every reduction in the amount of engine friction permits a closer approximation to theoretical conditions.

It is easy to determine the proper point of cut-off for any defined set of conditions provided they are such as can be mathematically expressed, and the larger the engine, the hotter the steam used, the higher the piston speed, the less the friction, and the more perfect the system of lagging and steam jacketing, the more nearly will the actual correspond with the estimated value; but the theoretical rate of expansion is rarely very nearly attained in our very best practice, and experience shows that we must usually content ourselves with a vastly smaller degree of economy by expansion than would be mathematically predicted.

Instead of cutting off at one-twentieth when using steam at 45 pounds pressure in a single cylinder condensing engine, we find that a cut-off of at most one-fourth gives, in practice with ordinarily good engines of moderate size, the best results.

In handling non-condensing engines of two or three hundred horse power, with steam at 60 to 90 pounds and a speed of piston of about 500 feet per minute, and using the standard forms of "drop cut-off" familiar to American engineers, we can barely gain by expanding more than five times.

"In general," taking engines of the best makers, as I have known and handled them, the best results have been, so far as I have observed them, obtained by expanding as many times as is represented by the product of one-half into the square root of the steam pressure in pounds on the square inch measured from the vacuum line, that is, $E = \frac{1}{2} \sqrt{P}$.

As pressures increase the benefit of condensation decreases, and it happens that this rule applies pretty closely both to the old-fashioned condensing steam engine with low steam, and to the modern American type of high pressure "automatic" cut-off engine.

Sometimes an engine is found to give maximum economy when expanding fifty per cent. more, that is, $E = \frac{3}{4} \sqrt{P}$.

No *theoretical* determination of the proper point of cut-off has ever been made that is of any service to the engineer. In "compound" engines of large size and high speed expansion can be carried much farther than in the older forms with single cylinder; but even they depart very greatly from the conditions assumed in calculation.

It thus happens that the benefit of expansive working has a limit which is very soon reached, and that the most radical practice, in which condensing engines are driven by steam of 450 pounds pressure, instead of expanding a hundred times, as would be indicated as proper by the purely mathematical analysis referred to by my correspondent, is limited to an efficient expansion of about twenty times, and probably gives best results with still less expansion. The fact is that no device yet invented has ever given a rough approximation to the efficiency indicated on purely theoretical grounds.

We are gradually learning more and more about the behaviour of steam in the engine, and are in our every-day practice, as illustrated by the best builders, keeping very close to what is, all things considered, the line of true economy.

Single cylinders are still doing, at their best, about the same work as the best compound engines, and are rarely made to expand, when condensing, nearly to the back pressure, and the best non-condensing engines hold the expansion line at its termination well above the atmospheric line. To double the rate of expansion in these engines would increase the weight and frictional resistances per horse power developed to so great an extent that this consideration alone forbids maximum expansion.

Steam jacketing and moderate superheating the steam are always sources of economy. A good single cylinder engine, with thorough steam jacketing, has been known to give an economy that is generally considered excellent at as low a rate of piston speed as 100 feet per minute, the coal consumed being but 2¼ pounds per horse power per hour.

Increased steam pressure benefits usually, but has its limits. I have known an engine of reputation, working with 250 to 300 pounds of steam, to require over 2½ pounds of good coal per hour per horse power, and its steam jacket proved quite unequal to the task of checking internal condensation. I have no doubt that a "longer cut-off"—the the steam was expanded only one-half as much as unchecked calculation would dictate—would have been better, and *perhaps* a less piston speed would have made the steam jacket more effective.

All these matters must be finally settled by experience.

Guatemala's Exhibition.—The largest and most enterprising of the Central American States, Guatemala, has entered the list of exhibitors, and announces the intention of holding an industrial exhibition in 1882. This is likely to furnish American manufacturers of articles suitable for the markets of that region a convenient opportunity for placing their products in a favourable way before the Guatemalan dealers and consumers

RECENT AMERICAN AND FOREIGN INVENTIONS

An improved ladies' dress guard, which will prevent the dress from clinging to and exposing the form when walking against the wind, has been patented by Tom O. Memory, of Key West, Fla It consists of a rounded garment, stiffened by a number of flexible strips running from top to bottom. It is worn over the abdomen, and is held by bands passing around the waist.

An improved horse hay rake of that form in which a revolving rake having teeth on opposite sides of its centre is connected to an axle mounted on a set of running wheels and is provided with stop devices, which either hold the rake rigid while it is gathering the load or may be released to allow the rake to revolve and the load to be dumped, has been patented by Messrs Isaac Q. Williams and Gustavus H. Osborn, of Goshen, Ark.

Mr. Eugene H Angamar, of New Orleans, La., has patented a simple and effective apparatus for *freeing railroad track* from snow and ice by heat, more especially street railroads, and the invention consists in a truck fitted for running on the track and supported on hollow wheels, which are fitted with grates for burning fuel, and perforated so that the wheels may be highly heated.

Mr. Hilliard B Smith, of Stephenville, Texas, has patented an improvement in *wind wheels* which consists in a novel arrangement and combination of wings or gates in a casing outside and independent of the wheel, whereby provision is made for adjusting the position of the wings, and consequently regulating the speed of the wheel, according to the force of the wind

An improvement in *rotary blowers* has been patented by Mr Charles A Smith of Philadelphia, Pa This invention consists in certain novel details of construction and arrangement of parts which cannot be readily described without an engraving.

Messrs Conrad Elmbeck and Fritz Wehnmann, of New Haven, Mo, have patented an *improved coupling* for connecting the forward axles and the bodies of buggies, buckboard wagons, and other vehicles, so constructed as to give the axle a free vertical and horizontal play, and thus better adapt the vehicles for use upon rough, uneven, and sideling roads.

An improved machine for *framing timber* has been patented by Mr Richard H. Watson, of Leadville, Col This machine is intended to accomplish by power the work of framing timber used in mines, shafts, tunnels, and similar underground works The inventor makes use of a suspended carriage or frame fitted for movement in vertical guides and carrying two horizontal saw arbors fitted at right angles. This is combined with a bed carrying adjustable head and tail blocks for holding the timber and presenting it properly to the saws. A winding drum and friction pulleys feed the saws, and devices of novel character center and clamp the timber.

An improvement in that class of *windmills* in which the wheel is inclosed in a cowl, has been patented by Mr. Albert S. Dimock, of Hutchinson, Kan.

An improved *lifting jack* has been patented by Mr. John Parr, of New York city. The object of this invention is to construct a jack that can be made to press both upward and downward at the same time, or to operate either upward or downward, as may be desired.

An improvement in the class of *targets* which are constructed of movable parts and connected in an electrical circuit with an instrument which is located at or near the place where the shots are fired, and is adapted to indicate the portions of the target struck by balls or bullets, has been patented by Mr. Morris Ullman, of Alexandria, Va.

A machine for *bending shafts or thills* for buggies and other vehicles has been patented by Mr. John H Smith, of Bluffton. Ind. The invention consists in a novel construction and arrangement of straps and formers, a screw, a cam lever, and a frame or table, whereby provision is made for simultaneously bending the heel and the point of both of the shafts of a pair.

Mr. Henry Schlimme, of Wiconisco, Pa., has patented a simple and durable *tuyere* for blacksmith's forges and the like. It consists in a bored cylinder provided with water chambers, longitudinal blast opening, a blast pipe and sliding valve, and water feeding pipes.

An improvement in *fences* has been patented by Mr. Joel D. Olinger, of Water Valley, Miss. The object of this invention is to construct fences so that they can be readily moved from place to place, and to make them strong, durable, and less expensive in construction than fences made in the ordinary manner.

An improved *thill coupling* has been patented by Mr. James S. Welch, of Dodge City, Kansas In this invention the conical bolt which holds the thill iron is considerably longer than the width of the thill iron, and the latter is constantly pushed toward the larger end of the bolt by a U-shaped spring

Mr. Marcus M Rhodes, of Taunton Mass, has patented an improved apparatus for *stamping and assorting disks* of varying thickness, for *coins, buttons*, and other purposes. The invention consists of an improved mechanism for feeding disks or planchets, to gauging calipers of a sliding spring caliper bar, the range of whose every movement is determined by the thickness of the disk being gauged, and a group of receiving tubes reciprocated beneath the calipers by novel mechanism

An improved *wrench or pipe-tongs* that may be adjusted without screws has been patented by Mr. Theodore P Franke of Buffalo, N Y. The invention consists of a hollow internally-socketed handle, containing in its upper section a movable serrated lower jaw resting upon a spiral spring, and adjustable by means of a rod that passes up through the handle

Messrs. James B. Campbell and Josiah Lindsay, of Mount Sterling, Ky, have patented a cheap and durable *wash-board*, designed to force the water through the clothes by a more substantial resistance to the hand than is afforded by other wash-boards The invention consists of metal rods running laterally across the face of the board, parallel to each other and at equal distances apart, and partly bedded in the board, grooves being made in the spaces between the rods, thus substituting the rods and the grooves between them for the corrugated metal sheet which commonly covers the face of a wash board.

An improved vehicle wheel has been patented by Mr. Charles W. Ball, of Macon, Ill The object of this invention is to construct a light, durable, and easily adjusted *vehicle wheel*, cast from steel or other metal, with hub, spokes, and felly all in one piece

Mr. Paul Gondolo, of Paris, France, has patented an improved process of manufacturing *tannin extracts*, which consists in the following consecutive steps:—First, macerating the crude material containing the tannin in slightly acidulated water; secondly, neutralising the free acid by an alkali or its equivalent, as described; thirdly, clarifying the solution by the introduction of blood, and then raising the temperature to the coagulating point of the blood, and finally separating from the tannin liquor the coagulated blood, with the salts and colouring matter, by filtration.

An improvement in *oil stills*, patented by Mr. Gerard Crane, of Salamanca, N. Y., consists in a novel arrangement of a small still within a larger or main still, and another small still outside of the main still, and a novel combination and arrangement of devices employed in connection therewith, whereby the process of distilling the oil is facilitated and hastened by enabling the oil to give off the more volatile products of distillation at the same time that the heavier products are being given off, and by means of the same fire for all the stills

An improvement in that class of devices known to the public as "*bale-band tighteners*," has been patented by Mr. Charles T. Christmas, of Rivertan, Miss. It consists of two end curved and cross-pivoted bars, having on corresponding sides of the ends a swivelled slotted block and cam lever.

Mr Gilman P. Richardson, of Bath, Me., has patented an improved means for fastening together the ends of the metal bands which serve to bind together the *staves of large tanks, barrels, hogsheads, or tubs.* It is made in the form of two strong tubes cast together, with their axes arranged obliquely to each other. Through the tubular openings in the tie the rounded ends of the band are to be projected, and then secured upon the opposite sides of the tie by screw nuts.

Mr Montraville W. Atwood, of Clayton, N Y, has patented a centre-board that may be applied to any *boat*, but it is specially adapted to a row boat, without interfering with the oarsmen, and be contained within a box that is water-tight, excepting at its bottom or keel opening, which box may be arranged beneath thwart of the boat. It consists of a centre-board constructed of two or more pieces or leaves, so that they may be folded and opened and elevated and depressed at pleasure by means of a bolt and lever, the centre board being contained in a low water tight box above the bottom of the boat.

An improved spring hinge has been patented by Mr. George Keene, of Chicago, Ill The improvement consists in placing the pintles of the gate or door forward of its rear edge, which is provided with a downward projection, and in applying a spiral spring to the lower pintle, so that its free ends project backward on each side of the projection on the gate or door, but do not bear against it except when the gate or door swings, being at other times in contact with studs which are fixed in the pintle bracket.

A shoe nail for the channels of boots or shoes roughened on its shanks having a body slightly tapered on two of its opposite sides, but drawn from the middle of the other two opposite sides to form an entering point, and provided with an elongated or diamond shaped head, has been patented by Mr. John Hyslop, jun., of Abington, Mass

Mr. Charles L Norton, of New York City, has patented an improved *spring clip for indexing books*, which is both simple and convenient. It consists in a clip of spring metal with sides of unequal length, and having a sharp bend near the end, and an index letter stamped on the part between the bend and the end of the clip, so that the clip can be placed on the end of a page with the lettered part projecting outward, thus indicating the index divisions of the book.

A *register* for registering the number *of fares* deposited in the fare boxes used in street railway cars, stages, and for other purposes, has been patented by Mr. Joseph N. Hordy, of New Orleans, La. The invention consists of a toothed cylinder pivoted in the lower part of the fare box below the tilting trap. The shaft of this toothed cylinder is connected with an index on a circular dial, so that as the cylinder revolves it turns the index, which shows on the dial the number of fares paid.

Mr. Bernhard von Schenk, of Heidelberg, Germany, has patented a *mass for manufacturing plastic objects*, consisting of sulphate of lime nine and a half parts, coal or coke one part, and iron shales sixty-hundredths of a part.

The Scientific Review

AND

SCIENTIFIC AND LITERARY REVIEW,

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Past Presidents:

SIR DAVID BREWSTER, K.H., LL.D., F.R.S., &c., from the establishment of the INVENTORS' INSTITUTE, till his decease, February, 1868. LORD RICHARD GROSVENOR, M.P.

President, SIR ANTONIO BRADY.

SESSION 1880—1881.

Members' Meetings at 8 p.m. on Thursdays, December 9th and 30th (Council Meeting); January 13th and 27th; February 10th and 24th; March 10th and 24th; April 7th and 28th; May 12th and 26th; and June 9th.

Annual General Meeting, Thursday, May 26th, at 4 p.m., unless otherwise arranged.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

Monthly Notices.

Mr. Edison, in the *North American Review*, has an article on his system of domestic electric lighting. He now uses for the production of his incandescent light loops of carbon prepared from a Japanese bamboo, enclosed in oval bulbs of glass from which the air is exhausted. He proposes that the electricity employed for illumination at night should be used as a motive power during the day.

The Royal Society, on St. Andrew's Day, November 30th, held their anniversary meeting, and the Council elected for the year ensuing as follows:—President, W. Spottiswoode; Treasurer, J. Evans; Secretaries, Prof. G. G. Stokes and Prof. T. H. Huxley; Foreign Secretary, Prof. A. W. Williamson; other members of the Council, W. H. Barlow, Rev. Prof T. G. Bonney, G. Busk, Right Hon Sir R. A Cross, E. Dunkin, A. J. Ellis, T. A. Hirst, W. Huggins, Prof. J. Marshall, Prof. D. Oliver, Prof. A. Newton, Prof. W. Odling, H. T. Stainton, Sir J. Paget, Bart., W. H. Perkin, and Lieut -General R. Strachey.

Light and Germination.—M. Panchon on October 26th made an interesting communication to the Académie des Sciences on the influence of light on germination. He measured the quantities of oxygen absorbed by identical lots of seeds in light and darkness. Light accelerates the absorption in a very constant manner, regulated by the degree of illumination, the absorption being accelerated by low temperatures. M. Panchon states that the absorptive acceleration produced by daylight is continued for several hours in darkness.—*Athenæum.*

Dr Salvator Vinci, of Catania, announces to scientific societies, by "proclamation," that a great revolution in the physical sciences is at hand, and that he has discovered, and will demonstrate ere long by indubitable and invincible proofs, that the essence of heat, of light, of electricity, of magnetism, and of life is—oxygen.

The new serial story in the *Quiver*, entitled "In Vanity and Vexation," which is already exciting a very strong interest, although the first instalment has so far appeared, is from the pen of the popular author of "Lost in the Winning," a story which achieved a remarkable success a few years ago in the same magazine.

Aural Defects of Engine Drivers.—Prof Moor, of Heidelberg, at a recent congress of orology, held at Milan, showed an excellent preparation of a portion of the ear, and gave statistics showing that engine-drivers on railways are peculiarly subject to certain affections of that organ, which might compromise the safety of travellers. The congress moved an address to all Governments recommending serious periodical investigations into this matter.

Ronald's Library has recently been opened at the rooms of the Society of Telegraph Engineers.

Spallanzani, the celebrated professor of natural history at Padua, who died on the 30th of February, 1799, is at last likely to have a monument to his memory erected in his native town, Scandiano, in the duchy of Modena, where he was born on the 12th of January, 1729. The secretary of the Académie des Sciences, at the Séance of October 26th, announced the opening of a subscription for this purpose.

Meteorological station on the Highlands.—A project is on foot for the erection of a meteorological station on Ben Nevis, as a public acknowledgment of the services of Mr. David Hutcheson to the Highlands. The committee already includes the Duke of Argyll, the Earl of Breadalbane, Mr. Milne Home, Dr. Angus Smith, F.R.S., &c. The Royal Society of London, the Meteorological Department of the Board of Trade, and other public bodies, have warmly advocated such a Highland station as a scheme of national value and importance.

The Lancet understands that Mr. Joseph Lister, F.R.S., has been nominated by the council of the Clinical Society for the office of president; and that Dr. S. Wilks has been similarly nominated by the Council of the Pathological Society.

THE SCIENTIFIC REVIEW
AND
Scientific and Literary Review

DECEMBER, 1880.

INVENTORS' DINNER, 1880.

On Thursday, 25th Nov., 1880, the Dinner of the Inventors, Friends of the Inventors' Cause, and Members of the Inventors' Institute, was held at St James's Hall, Piccadilly.

Sir Antonio Brady, President of the Inventors' Institute, took the Chair, and was supported by Vice Presidents, Admiral J. H. Selwyn, Dr. C. Siemens, F.R.S., and Mr. Cromwell F. Varley, F.R.S., and by the following Members of the Council of the Institute, viz., Messrs. Newton Wilson, T. Paterson T. Morgan, and F. H. Varley, and Mr. F. W. Campin, Secretary of the Inventors' Institute. Also amongst those present were Mr. W. Chesterman, Master Cutler of Sheffield, Mr. E. J. Watherston, Mr. J. Standfield, C.E., Mr. J. J. Aston, Q.C., Mr. Kingzett, Mr. F. Mond, and the Honorary Secretaries of the Dinner Committee, Mr. H. G. Hollier, and Mr. Morgan. Dessert having commenced,

The Chairman gave the health of the Queen, with which he coupled the rest of the Royal Family. The toast was drunk with the usual honors.

The Chairman next proposed the "Army and Navy and Reserve Forces," which was received enthusiastically.

Admiral Selwyn, speaking to the toast, said he knew that a great many of those who had felt the benefit attending the operations of the Institute for years would be quite ready to support the toast. Inventors were very poor sticks indeed when separated, and if they had not had that happy union of the bundle of sticks, they would have missed that result which they saw now within their grasp. (Cheers.) It was the opinions which were expressed by sensible men such as Mr. Bramwell and others, the putting before the nation the importance of the subject, not as it affected inventors alone, but as it concerned the whole nation, which was likely to give to them as a unit of the nation that security of property which they might fairly claim. That Institute was not existing wholly or merely for the sake of Inventors, it was supported because those who joined it saw distinctly that the whole issue which it was fighting was one which meant the security and the progress of the whole nation. (Hear, hear.) If they were to take the next lowest ground it would probably be that occupied by the capitalist. In the United States the capitalist found a ready investment for his money, because he was secure of his title (hear, hear), and because he saw his own profit in the matter, and seeing that profit he furthers the profit of the nation too. It had been strongly put before them that we were in great need of new industries, and that without them we could scarcely hope long to keep in the position of the richest nation of the world. Since if we all paid for food grown abroad, and did not receive an equivalent for our industrial production, he need not tell them what the result would be. (Hear, hear.) That was the moral apotheosis of a nation where there is given to every man the exact compensation which his brain or manual labour deserved. In securing to him the results of the labour of his brain or his hands, they secured contentment in the State and respect and security for the property of others: and all those moral virtues which proceeded from a due appreciation of the meum and tuum principle. (Hear, hear.) And thus in a nation which respected property in every degree, whether property created by brain labour of novelists, as referred to by Mr. Cromwell Varley, or of the greatest inventors, like Sir H. Bessemer and Dr. Siemens, it would be found that a contented nation had been created; and that if all the existing property of a nation were in the hands of a few individuals, and if all were protected equally in the creation of that kind of property which did not previously exist, no one would seek to rob the other when each one could create property for himself. (Hear, hear.) If that Institute be the means of producing such a result of inducing nations and their governors to look higher than the mere fleeting interests of capitalists, at the broad interest of humanity, they would have laid the foundation of a much wider good for future life on this earth. (Hear, hear.) He called upon those who did not yet know the Institute to peruse its reports to see how, weakly and feebly it was true, but always consistently, they had advocated this cause, and to join them in their efforts, to give them strength and to help forward the movement for the advantage of the weak and helpless advocates of material progress against the strongly entrenched vested interests who opposed it. (Cheers.) Their old friend Mr. Broadhurst occupied a new position now; and he was sure that no nobler work could be proposed to himself by any member of the House of Commons than that which would produce contentment amongst all honest working men of a nation, not by strikes, not by feud amongst themselves or with their employers, not even by social revolutions could this be done, but by securing to every man that which he earned by his work of whatever kind. He hoped that everyone who knew how wide and how important their objects were would think it a duty to encourage by every means in his power, the support and the well being of the Institution—the Institute of Inventors. (Applause.)

The Chairman next gave the Health of the two Houses of Parliament, and congratulated the Inventors' Institute on having among them to-night Mr. Broadhurst, who was one of their oldest and most esteemed friends, and endeared to them by many ties, he being a very well instructed member of society which dealt with Patent Law; and it was to be argued from his presence to-night, and the Bill which he had introduced into Parliament on the subject which was so dear to the hearts of the members of the Institute, that they were on the eve of gaining that which they had aimed at for many years, viz., an amendment of the Patent Law. (Hear, hear.) He coupled the name of Mr. Broadhurst with the toast, which was drunk with enthusiasm.

Mr. Henry Broadhurst, M.P., in responding, said he was a very unworthy representative of their Parliament to undertake the duty of replying to the toast. He believed the present House of Commons was resolved to do justice to the English people of whatever class or shade of political opinion. He should not attempt to claim for the present House of Commons a great talent for inventive genius. (Laughter.) He hoped the House of Commons would prove to be full of worthy workmen in accomplishing the task the Institute had undertaken. (Hear, hear.) They were assembled together that evening to discuss rather the desirability of bringing the power of Parliament to redress the wrongs of whatever class. With respect to a reform of the Patent Laws, he thought they were occupying a better position to-night than they had done for some time past at their annual dinner. (Hear, hear.) He should be much mistaken indeed, if at that time next year they were not in a position to congratulate themselves and the Institute upon the passage of a good sound Patent Law Bill. (Cheers.) He need scarcely tell them that he was not in possession of the intention of the ministers as to the measure they meant to introduce next session, nor was he able to say that a Government Patent Bill would be brought forward; but he could say conscientiously, it was his firm conviction that a Bill would be introduced by the Government, with the clear and honest intention to carry that Bill through Parliament next Session. (Cheers.) Reform of the Patent Laws, in his judgment, surpassed all matters with regard to Foreign questions. (Hear, hear.) Those were all small matters of detail, which called forth the Fleet of Europe, and a mere pastime to play at. The difficulty was to get Parliament to think likewise. He believed that those who would be responsible partly for the measure, should one be introduced, were considerably more alive to the importance of the subject than they had been for years past. He had a conviction that they were prepared, if not to go the whole length of the Bill introduced by Mr. Anderson, to take that Bill as a basis for a Government measure. It would be remembered that that Bill proposed that the application for protection should cost only ten shillings; the second process should be ten shillings only, and the higher payments should be reduced to £20, and the other two to two £40 payments. Those sums in the aggregate were considerably less than the present charges. Whether they would obtain all that Mr. Anderson proposed, he was not quite clear. He was convinced that Mr. Anderson's proposals were nothing like sufficiently Liberal. (Hear, hear.) But in Parliament it was necessary to trim proposals down to such proportions as were likely to pass through the legislative machine, and if too radical a reform were proposed in the Patent Laws, they would be put down as mad inventors, and no one would listen to them for a moment (Hear, hear.) If, however, a Bill could be obtained upon the basis of Mr. Anderson's proposals it would be a great advance He would venture to say that even if a discussion on the subject of the Patent Laws could be obtained in Parliament it would be such an educational advantage to the country, that then another Bill for giving still more liberal terms to poor inventors, would be considerably easier to pass through Parliament than the present measure. (Hear, hear.) The great difficulty was to get people to know its immense importance, and to understand its great value (Hear, hear.) He quite agreed that when they gave reins to their fancy as to the value of inventions to this country, and as to the value which had been absolutely destroyed through the prohibitive tariff of the Government, it was something astonishing (hear, hear), and if the British public could only be sufficiently interested on the subject, he would undertake to say that no Government could live that did not apply itself to simplifying and cheapening our Patent Laws. (Cheers.) He found from returns put into his hands, that the American people had issued nearly 13,000 patents during 1879, while England had only issued some 3,500 Surely we were as inventive a people as those of the United States. (Hear, hear.) As a fact, unless a man was a small capitalist, or had a capitalist at his back to assist him, he could not possibly bring his inventions out in this country. (Hear, hear.) He declared that they were perfectly justified in forcing the question upon the attention of the Government, not only from personal interest, but for the fact that it was patriotic work that they were doing (hear, hear,) when they considered how every day this country was being placed more and more in competition with the productive nations of the world, and how every year increased the necessity for England relying upon her manufacturing rather than upon agricultural productions (hear, hear,) it became more and more urgent that we should encourage by every possible means, every little inventive faculty that developed itself amongst our people (hear, hear); instead of that our Laws at the present moment were doing their best to smother them. (Cheers.) He was discussing this matter with a gentleman of very great influence and high position in the House of Commons, who suggested that in discussing the subject and getting it on the programme of Legislation, they must consult the Treasury, because the Treasury was largely interested in the revenues at present derived from Patents. He suggested that they had better lose the revenue from the income on Patents, and even put it on beer, if necessary, rather than extract it from its present source. (Hear, hear.) If they would remove the shackles from our inventive people, the revenue instead of being what it was at present—a bare trifle compared with our income and expenditure—would double and treble itself in a few years in revenue alone, to say nothing of the immense increase of permanent wealth to the country (cheers) which would be derived from increased machinery and increased labour saving arrangements. The subject was one of national importance (Hear, hear.) He promised to give their cause his heartiest support in Parliament, and to use what influence he could on the subject with those in authority He believed that improved Patent Laws would promote a great increase of labour throughout the country, and greater income from industrial resources, and a greater revenue to the Exchequer from inventors' fees, (Hear, hear.) He hoped they would all live long enough to see the cause which they had met to celebrate, triumphant by the passing of a just and necessary reform of the laws of our country. (Applause.)

The Chairman, in proposing "The Inventors' Cause," thanked Mr. Broadhurst for having said so much of what he himself intended to refer to. We lived in times when we were face to face with great depression in trade. The question was how to revive it. A friend at the Cobden Club had recently written to the farmers of Western America asking them not to vote for any member of Congress who would not go in for doing away with protection. The protection we had to contend with in America was a serious thing for our artizans and manufacturers and our trade in general. (Hear, hear.) His friend, in proposing that they should do away with protection had not suggested the right remedy, for it had called forth from America a reply which was the most exhaustive and tremendous defence of their protective policy that had ever fallen under his observation. His friend showed that the American object in their protective policy was to promote their local and their home manufactures. They wanted to create a home trade They said in a pamphlet that our coal fields and iron mines were becoming exhausted, that our coal fields were becoming so deep that it was only at great expense the minerals could be raised to the top. He himself had been three times to America, and he had been appalled at seeing the marvellous means those people had of competing with us. (Hear, hear.) We had formerly the best artizans, the best genius, the best iron and coal and land in the world, but those Americans, since the Exhibition of 1851, had opened the eyes of the old and the shortcomings of other nations which had set themselves to remedy the defects under which they were labouring. In America he found that we were competing not only with a protection tariff of thirty, forty, and in some instances fifty per cent., but that we were competing with a country which Providence had blessed with the means of production which outshone any other country. He saw thousands of square miles of coal on the surface or on the side of the hills, and ironstone of the most magnificent quality, and hematite, one of the most valuable forms of mineral ore that we could possess. They could make Bessemer steel without any difficulty with the coal which was interlaced with them 60 or 70 or 80 feet in thickness, above the water level, only requiring to be put on to a railway or on navigable rivers, navigable for 20,000 miles. Not only so, but we had to compete with a country where the railways cut through coal fields of 12ft. thick, where the coal was in such abundance as to last for years, and where the production of the soil was so good that they were able to produce 60, 70, or 80 and in many cases 100 bushels per acre. Coal there, like every other commodity, had no value unless it could find a market, and this difficulty the Americans were gradually removing by opening up railways and water communications to the markets of the world. The strata of coal was so favoured by nature that they had nothing to do but to send it to bank by a certain gradient, and it travelled by gravity. They had not to hoist 600 fathoms from the bowels of the earth. They had all those advantages with which we have to contend with as difficulties. Therefore they could produce iron and all the necessaries of life in a way that we have no conception of. Consequently the manufacturer of this country had not only to compete with a high protective duty, but with large natural resources, and which could only be competed with by improved education of our artizans by imparting technical knowledge and by promoting the genius of our people for inventions to the utmost —(Cheers.)— and the improving and cheapening of tools for the cheapening of labour (Hear, hear.) Therefore he urged that the question which the Inventors' Institute advocated was not a narrow one, but a national question. (Cheers.) It involved not only the safety of our country, because we could not grow enough corn in this country—we were obliged to import, and unless we could pay for it by our manufactures our country would get poorer day by day. (Hear, hear.) The only possible remedy was to encourage the inventive genius of our people, and he was sure the Anglo-Saxon race, if they had the same advantages of education, would give a good account of themselves if their genius were not wasted by Patent Laws which required £175 in fees, and then had only a license to go to law. (Loud cheers.) In America he enquired into the Patent Law in force there, and found that a patent could be got for £7, and recently the American Government were so alive to the necessity of patent inventions that they said they had no right to make the enormous profit they did out of Patent Laws (Hear, hear.) The £7 charged was too much, and they were proposing to reduce it to £3 10s. (Cheers.) He believed so truly in the Anglo-Saxon race that providing they were given liberty and were not overweighed with objectional taxes that we should hold our own in the race of the world. (Hear, hear.) They were that day burdened with the most iniquitous tax ever levied upon the brains of our people—the £175,000 paid for patent fees into the public exchequer (Hear, hear.) Any Chancellor of the Exchequer who hesitated to renounce that profit would be one of the most wicked Chancellors ever seen It was a tax on knowledge and on the inventive genius of our people, and lost tens of thousands to the trade and commerce of the country. If the Chancellor of the Exchequer would reduce the tax to the form which that institution recommended it would benefit the nation and bring an increased revenue. (Cheers.) Therefore he felt the Institute was doing a great work in trying to press upon the Government the necessity of a cheap and good Patent Law. (Hear, hear.) The present system of merely a license to go to law was not the way to improve the trade of the country. As an instance of the bad patent laws of other countries injuring the commerce of the country, he referred to Dr. Siemens, who came over from Germany with his invention, which had benefitted the whole nation, becase Germany at that time had not such a good Patent Law as we had. If we were to enjoy the blessings we wished we must improve our Patent Laws, and not levy duties upon the brains of our people. (Hear, hear.) In asking them to drink to the inventors' cause he believed it was a national one, and the only cause which would enable this country to hold its own in the future competition with the world. (Loud applause.)

The toast was drunk with all honours.

The **Chairman** called upon Dr. Siemens to respond to the toast.

Dr. **Siemens** remarked that the Patent Law of this country was of particular interest to himself. It was the cause of his coming over to this country and to make it his home. Thirty-six years ago he took out his first patent; since then he had taken out many others. He thought the revenue which had accrued to the exchequer during his 36 years residence here would make up a nice sum. However, he would not complain, for all inventors had hard times to fight through, but if they only threw that perseverance into the work for which this nation were so famous they were sure to succeed in the end. The Patent Law as it stood was good in some respects. Any person had a right to obtain a patent, but on the other hand he had to pay for his privilege. As the Chairman said, after all, from a legal point of view, it was nothing but a license to go to law upon. (Hear, hear.) To his fellow inventors he cautioned them to avoid the law as much as possible. (Hear, hear.) There were generally two ways of settling a difficulty. The one was to strip and fight, which, although perhaps more congenial to the impulse of the moment, was a great loss of mental and physical power, and financial energy; and often one's views might be modified considerably if brought to the touchstone of a very dry and impartial investigation. (Hear, hear.) He always found it better for those differing from him to meet him in a spirit consistent with right and moral feeling, and by so doing the law courts were avoided, which he detested more than any other place. Previous speakers had already pointed out forcibly certain great defects in the law at present, Its chief fault was its costliness to the poor inventor, who ought to be encouraged by all means to obtain security for his invention. (Hear, hear.) Not only should he be assisted in making things easy for him as regards payment, but what was of still more importance, he should be assisted by timely advice. (Hear, hear.) If he went to the Patent Office and put in a provisional specification, nobody could tell him exactly whether the thought which had struck him at the time was nothing more than a new or old thought The chances were that it was not a new thought, because bright thoughts cross so many minds. But, however, the Chancellor of the Exchequer says, "Pay your money and take your choice." (Laughter and hear, hear.) That meant £180,000 a year, and it was worth having. Now, every man ought to do something for the money he receives, and the Government in receiving those heavy fees ought in common justice tell the inventor whether he was likely to spend his money profitably or not (Hear, hear.) There were the means at their command to do that if they would put the law in force which provided that there should be a good Patent Library. (Hear, hear.) It was better than it used to be, but much remained to improve the machinery of the library (Hear, hear) The law speaks of a Patent Museum. Well, if any of them had been to South Kensington and looked into the wild and dingy assemblage of most valuable old models—and some of them were exceedingly valuable—but to call it a Patent Museum was a farce. A Patent Museum ought to show every invention of any importance that had ever been made. (Hear, hear.) If they merely picked up chance things and stuck them there they were of no use whatever. It might gratify sightseers, but was no use to inventors. If there were to be such a thing as a Patent Museum make it a reality instead of a sham. (Cheers.) There were Commissioners named by the law who had never been provided, for the reason that if they were appointed they would be expected to do the work, and the work was not to be done. There was a certain examination by the Crown officers, who were utterly incapacitated from their business to do anything for the patent business except pocketing the fees. (Hear, hear.) Those officers looked at the form of the application, and if it was on the right sort of paper, and written in a proper manner, and did not contain a contradiction on the face of it, they passed it as a good application, and granted the patent. (Hear, hear.) Now, instead of that, if persons were appointed who would search the Patent Library and point out to the applicant what ideas had gone before him in the same direction without asserting the right of absolutely dictating to him, but simply advising him on what had gone before, it would save many, himself included, the great trouble, expense, and inconvenience of having gone to the Patent Office and made a false step. (Hear, hear.) He thought there were those important duties to be performed for which we paid enormously, and which were not performed according to the present law (Cheers.) The question of expense came next. The patent fees could only be justified on the score of providing for the convenience of intending patentees the necessary information. (Hear, hear.) For any other reason it would be a most iniquitous tax to put upon the inventors' of the country, and men, too, who were professedly not men of wealth, and who received no present equivalent for what they paid (Hear, hear.) If a tradesman paid taxes to Government in proportion to the business he had done, not in proportion to the business he intended to do next year, well and good, but it was wrong to tax an inventor for his patent more than a fee sufficient to pay the office expenses. (Hear, hear.) Ten years ago Germany had no Patent Law. There was an Inventors' Congress held at Vienna, attended by representatives from all European countries, when a general outline of law on the subject was discussed and laid down, and Germany had since profited very much by the Congress, and had granted an excellent Patent Law (hear, hear), the results of which were truly marvellous. Last summer he went to Dusseldorff to a meeting of the Iron and Steel Institute, and visited many works in Rhenish Prussia which he had known before, and had not seen for many years, and the spirit of advancement which now manifested there was beyond belief. Everything was made open , there was competition on all hands where there was secrecy and imitation only before. With regard to America he fully corroborated what the Chairman had told them , it was only the Patent Laws of America that worked the wonders to be seen there. (Hear, hear.) He had taken a Patent there which had produced perhaps better results than those in any other country. (Hear, hear.) The facility given there to inventors was truly remarkable. Only a few months ago he received a very characteristic telegram from a gentleman in Philadelphia, "I want to use your invention, but see that you have not patented it. When are you going to patent it that I may use it?" (Laughter.) He, Dr. Siemens, thought that a perfectly true view of the subject. The American was annoyed not to find the Patent for this thing which he wanted to use. The meaning of that was, "You sluggards! what are you about, why don't you patent, as we want to use it" He wanted to have it brought to him already made for use, because he knew well enough that if he tried to use his invention from various reports which he might obtain from newspapers, he would very likely miss his mark and pay much more for it than he would if he went to the Patentee and said, "Now, give me all the information and I will pay you for the use of it." (Hear, hear.) It was the principle that should be instilled into our Legislature, not to look upon Patentees as monopolists, but as most useful and necessary servants to the people and the country. (Applause.)

Mr. **Cromwell F. Varley** said—In rising to reply to the "Inventors' Cause" I cannot do better than to give my experience both as an inventor and a patentee. In 1854, when I took out my first patents, my first duty was to study the Patent Law, but my occupation as electrician of the Electric and International Telegraph Company, and afterwards as engineer-in-chief of the same company and of the Atlantic Telegraph Company, so engrossed my time that I found it necessary to leave legal matters entirely to my solicitors and patent agents It is my impression that had the Act of 1852 been carried out as originally intended, had proper Commissioners been appointed as directed by the Act, and had they exercised the powers of that Act, the administration of the Patent Laws would have been more in accord with the requirements of the times. Such Commissioners would have seen the advisability of fostering invention by simplifying the operation of the laws, and of making at least a substantial reduction of the fees and other legal expenses. The experience of other countries, notably Germany and the United States, shows that such a reduction would have increased the number of patented inventions so largely that the exchequer would have derived a much larger revenue from the increased number of cheaper patents than is now reaped from the present prohibitory high rates. Large as is the profit to the State obtained by patent fees, the gain is but a mere trifle compared with the benefit the country would derive were inventors enabled to, and encouraged to, make patent all their numerous mental creations, instead of keeping secret nine-tenths or more of them, waiting or hoping for an opportunity to bring them before the public. The wealth of this country is mainly due to the intelligence and inventive power of its workmen, and everything that checks the development of this intelligence, or tends to prevent inventors from making public their mental creations, deprives the whole community of an enormous amount of wealth and prosperity. The law as at present administered throws numerous and vexatious obstacles in the way of inventors not backed up with large funds. It has become a system for the momentary benefit of the wealthy few as against the hundreds of thousands of nearly impecunious workers who constitute the solid basis, the very foundation of the constitution as of the national wealth and world-wide influence of the country. In a few words, it is class legislation of the very worst type. Let us for a minute compare the large protection afforded to the inventor of a new novel or narrative with that afforded to the inventor of a new process whereby human labour is saved, or cost of production is reduced, or facilities of intercourse increased. As an example, let us compare a Beaconsfield with a Bessemer. The former for a sum of less than £1 will have his creative power secured to himself for forty years, while the latter has had to pay many thousands of pounds for the right to make a profit of his invention for a period of only fourteen years. The public press informs us that Lord Beaconsfield by his new novel will reap over £10,000 for copies already ordered in anticipation. Bessemer, on the other hand, had to spend many thousands of pounds and many years of tedious labour before he could get any real advantage, and then he received in return for his great outlay a right extending for only a few years, and that coupled with the prospect of expensive and tedious litigation. How much will the national wealth be increased by the new novel of the late Premier, as compared with the benefit already reaped by the whole nation from the Bessemer process of economically producing steel in unlimited quantities. The latter, by reducing the wear and tear and the cost of our railways, of our steamers, and of our machinery, benefits every man, woman, and child in the United Kingdom and elsewhere. Did our Government fully realise the importance of establishing the very basis of our national existence in the most solid manner, they would rather pay and foster the inventors of new and useful processes than make them pay heavily for what in the majority of cases is a very uncertain advantage. While the writer of a new story obtains an immediate return for his mental creation, the inventor of a new process has to wait, as a rule, many years before he begins to see his outlay come back, and too often the fourteen years granted expire before he has reaped any solid reward. This acts as a damper upon the energy of our nation's true supporters. A wise legislation would encourage invention and industry in every possible way and so promote the welfare of the nation, and assure the peace and stability of the millions. This nation, which has such numerous and important colonies and dependencies, and such a great foreign trade, owes her greatness, her stability, and her moral sway over the world at large more to her manufactures than to anything else. The most suicidal policy any Government can pursue is to put obstacles and discouragement in the way of those who improve those manufactures upon which our very national existence depends. Once let us fall behind our neighbours and our colonies in this respect, and our empire must inevitably fall to pieces. Mr. Anderson's Patent Bill which will shortly be before Parliament, provides a substantial amelioration of many of the evils under which inventors labour, and considering the difficulty of getting useful legislation through Parliament at all, it is my opinion that inventors should give him and his bill their undivided support. That the Irish question which demands the immediate attention of the Government is a burning one, is true, but the time is at hand when much larger interests must be considered before it is too late. The whole of the United Kingdom is suffering from depression of trade of an aggravated form, and farmers here, though not in rebellion against the laws, are as badly off if not worse than their Irish brethren, What is the remedy for this widespread discontent? Not repression of the people, but removal of the cause. Were invention and industry carefully fostered, new openings would be afforded for the labourers of the kingdom, the national prosperity would increase in a startling ratio. All men would be able to pay their way, dissatisfaction would be replaced by contentment, and sedition would receive its quietus. If my remarks make any impression upon those able to influence the legislature, I hope they will impress upon the Government the importance of removing the causes of dissatisfaction by fostering into sources of national wealth those energies now wasted in apathy, or, what is worse, undisguised rebellion. I hope our Government will afford the necessary opportunity and give the required support to enable Mr. Anderson's measure to be passed into law early next session. I suggest that we inventors take counsel together and form such a deputation to the Government as shall demonstrate the national importance of our cause.

Mr. STANDFIELD felt that there were a great many problems to be solved, and the proper man to solve them was the inventor. One problem was how to save the great loss of life that occurred every year in our mines, wherein upwards of 6000 lives were lost every year, and probably twice that number maimed. On our merchant marine many thousand lives were lost, and also on railways. and statistics would prove that during the last sixty years inventors had so far improved our breaks, mining, and winding appliances, &c., that where thousands of tons of coal were raised only half the number of lives were now lost that were lost sixty years ago. (Hear, hear). That saving of life could be put down to the inventors' genius of this country. (Hear, hear.) It must be borne in mind that before our millions could be fed our products must be sold in foreign markets, the necessary means of purchasing which we must provide. Another problem solved was how to find employment for the ladies of this country. Our inventors had already done this for millions of them in the cotton-spinning districts of Lancashire, and no doubt if the great obstructions of stamp duties were removed we should find employment for all our surplus population, male and female, and also for our youth light and lucrative employment if the present restrictions on inventors were removed. (Hear, hear.) He felt that out of the 15,000 lives lost every year that half the number were thrown away because our inventors were not allowed to go freely to the rescue. (Hear, hear.) It was different in the United States. There they taxed only £7 against £175 in this country, and it was 25 to 1. It was clear if we were to hold our own as merchants and be successful in trade we must allow inventors to assist in every possible manner to supply labour-saving tools, and so that we might be better able to hold our own with rival competitors, (Hear, hear.)

Mr. CHESTERMAN, the Master Cutler of Sheffield, in appropriate terms proposed, as the next toast, "The Inventors' Institute," which had doubtless done much in times past to keep the important national question of Patent Law before the public, and would be doing good service by stepping forward at the present time and working for a really good and cheap Patent Law, and he thought he might say that it would not be so very long before this desideratum would be effected; such an expectation might well be hopeful whilst the Institute possessed the president and officers it did. He would ask the much esteemed secretary, Mr. F. W. Campin, and Mr. F. H. Varley to reply to this toast.

Mr. CAMPIN being unable to use his voice from the effects of an attack of bronchitis, had his speech read for him. It was as follows:—Never in my life have I been placed in a more difficult position than at the present moment, seeing I am kindly favoured by the public manifestation of your estimation of myself and my efforts on behalf of the Inventors' Institute, and at the same time am by ill-health debarred from replying to such public manifestation with that feeling and freedom which the capability of the use of healthy organs of speech would have afforded me. Just now this is to me a special source of regret, for not only would I have tendered to you *viva voce* my hearty thanks for your kind recognition of my services as secretary to the Inventors' Institute and advocate of Patent Reform of many years standing, but I would have made the present occasion the means of putting forward some statements in regard to the working of our patent system at this time,—desiring as I do to present you with this, because I think I can show that quite independently of those cardinal points of a good patent system, namely, cheapness and efficiency, as to which nearly every speaker will tell you something to the purpose, I wish to urge upon you that we also require what we ought now to have under the present Patent Law, namely, a reasonable and efficient management of the Government Patent Office, and of the proceedings which a patentee is legally compellable to fulfil in order to secure a patent. (Cheers.) Certainly no one would expect anything less than this from a system presided over by such high and honourable men as our Lord Chancellors, Masters of the Roils, and her Majesty's law officers for the three Kingdoms In truth and in fact, however, these high officers have troubled themselves but little in the matter, they having for a number of years entrusted the management of the office to the hero of what some people have been pleased to call the Edmunds scandal. Mr. Leonard Edmunds, the late Clerk of the Patents, whose policy was, taking in as many fees as possible, and spending as little thereout as might be, a system that would soon have come to grief if the post of Superintendent of Specifications concurcurently with Mr. Edmunds' appointment, had not been assigned to Professor Bennett Woodcroft, who did, as far as such a beggarly system would allow, bring the Library and Publication Department into something like an efficient state. However, at last the Edmunds scandal came to a settlement, and scarcely had this been brought about and Mr. Woodcroft placed in the ascendant, than that gentleman found himself getting old and unable to fulfil the duties of his office, which he accordingly resigned. Hereupon a gentleman fresh from that ultra-circumlocution office, the Board of Trade, who, having been doing dilettante work for several years in connection with a well-known society, was appointed Clerk of the Patents, also Registrar of Designs, and, still more, charged with the onerous duties of Registrar of Trade Marks, which involved the working of an entirely new Act requiring great care and circumspection in its administration. As to the results of this course of action on the part of the Commissioners, the Patent Law Publications are frightfully in arrear. The most important of these, the abridgments of specifications, some of the important classes being brought up no nearer to the present year than 1865—a few classes having been brought up to 1875 or 1876—which is practically the work of four years by an official staff that one would have expected would have brought up nearly all the classes to something like the present date. And as to rules and regulations of the office, none have ever been made but such as curtail the inventors' rights, some of them being violations of the Act, and some, it would seem, never having been submitted to the Commissioners at all. All this, my friends, shows that Patent Law Reform is needed even for the reasonable and efficient working of the present Patent Law quite as much as to carry on a new and improved Patent Law

Mr. F. H. VARLEY, in rising to respond to this toast, said that having been an active worker in the Executive of the Inventors' Institute, he felt that it would be impossible to say too much on its behalf, for it had for years past been the acknowledged advocate of the inventors' cause, which was no mean or selfish one, for it embraced a really national question; nay, more than that, a question of civilisation and progress, and he trusted that our legislators would soon come to understand that the cause of the inventor was one superior to all others (Cheers.) But beyond all things the Inventors' Institute made a point of taking a practical course. Hence it now proposed to give its support to the Bill brought forward by Mr. Anderson, Mr. Broadhurst, and other M.P.'s, rather than elaborate a measure of its own, which, although it might be the acme of perfection, might fail to please all parties. His motto was—Let us do something practical without delay. (Cheers.)

Mr. J. J. ASTON, Q.C., proposed the "Dinner Committee," who had brought them together and presented them with such good fare, and having done this he would beg to be allowed to say a few words on the main question in which all present were so much interested. As a lawyer having much to do with patent questions, and himself an inventor, he could say without reserve that the present Patent Law needed not merely cheapening, but thorough revision.

Messrs. Morgan and Hellier, the honorary secretaries' names, were coupled with this toast, and they duly acknowledged the same.

The Vice-Presidents and Council of the Institute were drank and duly replied to, and the proceedings terminated with the usual ovation to Sir Antonio Brady, the President and chairman of the evening.

Proceedings of Societies.

NUMISMATIC SOCIETY.

Oct. 21.—J. Evans, Esq., D.C.L., President, in the chair.—Mr. Hoblyn exhibited patterns for a penny and halfpenny of George III., 1788, by Pingo, the former being the first copper coin struck of that denomination; also a penny of Jamaica, struck in copper instead of white metal, and patterns of one-cent and half-cent pieces of Nova Scotia, 1861, differing materially from the current coin.—Mr. Pearson exhibited a curious and unpublished leaden medallet of Queen Elizabeth, with the inscription NIL NISI CONSILIO, 1588.—Mr. Gill exhibited a styca of Wulfred, Archbishop of York, of base silver, and a copper coin of Cunobeline found at Chester Camp, near Wellingborough, of the type of Evans, Pl. xii. 6.—Mr. P. Gardner read a paper on some new and unpublished Bactrian coins.—Captain E. Hoare communicated a paper on some early and modern tokens bearing the name of Hoare.

ENTOMOLOGICAL SOCIETY.

Oct. 6.—H. T. Stainton, Esq., V.P., in the chair.—Sir A. Scott and Mr. F. E. Robinson were elected ordinary members. — Mr. McLachlan stated that last year he had exhibited specimens of *Anthocoris nemorum*, an Hemipterous insect supposed to be damaging the hops growing near Canterbury, but had then expressed his opinion that the insect was not the true culprit, its habits being probably carnivorous. This year he had received from the same correspondent some small larvæ which had been found in the cones, and these he considered were not only the true enemy of the hops, but were also the food of the Anthocoris.—Sir S. Saunders exhibited a series of apterous females of the new species of Seteroderma adverted to at the previous meeting, and read remarks thereon.—Messrs. Kirby, Fitch, Ralfe, and the Rev. E. N. Gilbert exhibited several varieties of Lepidoptera taken in this country and on the Continent, some of which, from the structure of the antennæ, were considered "hermaphrodite" forms.—Mr. H. Ramsden communicated a note on *Pyrophorus causticus*, a Cuban fire-fly.—Mr. Swinton read two papers entitled "Some Experiments on the Variability of Lepidoptera undertaken during the Year 1880," and exhibited specimens and figures in illustration.—Mr. Butler communicated a paper entitled "Observations on the Lepidopterous Genus Terias, with descriptions of hitherto unnamed Forms from Japan."—Mr. Waterhouse communicated a paper "On the Buprestidæ from Madagascar." — Messrs. Kirby, Distant, and McLachlan called the attention of the society to a method of publishing descriptions of new species pursued by M. André in recent parts of his work on European Hymenoptera. These were not only inserted on the cover of his quarterly parts, but even at the end of sheets of advertisements laid loosely between the pages of a part. It was regretted that no other course than that of protest and disapprobation could be applied in the interest of science to such a practice.

QUEKETT MICROSCOPICAL SOCIETY.

Oct. 22.—T. C. White, Esq., President, in the chair.—Two new members were elected. —Mr. F. Crisp exhibited an improved form of bottle slide, which could be adjusted to any desired thickness, and might be taken to pieces when required for cleaning.—Dr. M. C. Cooke read a paper "On New Freshwater Algæ found during the Year," in the course of which he described nine species which were new to Great Britain, of which three were new to the British Isles. Another species also found was as yet unnamed. The new species were found by Mr. Wills at Capel Curig, and belonged to the genus Staurastrum.

ROYAL INSTITUTION.

Nov. 1.—G. Busk, Esq., Treas. and V.P., in the chair.—Mr. L. E. Ames was elected a Member.

ARISTOTELIAN SOCIETY.

Oct. 25.—F. G. Fleay, Esq., V.P., in the chair.—Mr. Frederic Harrison and Mr. R. A. Chubb were elected Members.—A paper by Mr. J. A. Cooper was read, "On the Scholastic Philosophers."—A paper, "On the Arabian Philosophers," was then read by Mr. Harold Senier. The author traced the general course of Oriental philosophy from the eighth to the thirteenth century, treat-at length the theories of Algazzali, Averroes, &c. Finally, he traced the effect of the Arabian philosophy upon succeeding schools.

GEOGRAPHICAL SOCIETY.

Nov. 8—Lord Aberdare, President in the chair —The following gentlemen were elected Fellows: Sir C. F. Shand, Major-General W. A. Fyers, Col. R. Harrison, Messrs. R. Bayly, W. Callow, H. Collier, C. Cooper, G. H. Drew, C. R. Fenwick, W. Fowell, and S. S. Thorburn.—The paper read was "Journey to the Lukuga Outlet of Lake Tanganyika, *viâ* the North End of Lake Nyassa," by Mr. J. Thomson.

GEOLOGICAL SOCIETY.

Nov. 3.—R. Etheridge, Esq., President in the chair.—Mr. B B. Woodward was elected a Fellow.—The following communications were read: "On the Serpentine and the Associated Rocks of Anglesey, with a Note on the so-called Serpentine of Porthdinlleyn (Caernarvonshire)," by Prof. T. G. Bonney. —"Note on the Occurrence of Remains of Recent Plants in Brown Iron Ore," by Mr. J. A. Phillips,—and "Notes on the Locality of some Fossils found in the Carboniferous Rocks at T'ang Shan, situated in a N.N.E. direction, about 120 miles from Tientsin, in the Province of Chih Li, China," by Mr. J. W. Carrall, with a Note by Mr. W. Carruthers.

ARCHÆOLOGICAL INSTITUTE.

Nov. 4.—Sir John Maclean in the chair.—On this, the opening meeting of a new session, the Chairman congratulated the members upon the success of the second meeting of the Institute at Lincoln, and on the exhibition of helmets and mail held at the rooms of the Institute in June.—Mr. C. D. E. Fortuum read a paper "On Finger-Rings and on some Engraved Gems of the Early Christian Period," which was in fact a continuation of former paper by the author on the same subject, which have been printed in the *Archæological Journal*. The paper treated respectively of Christian finger-rings, rings Christian or otherwise. and engraved gems of various kinds.—Prof. Westwood read a paper "On an Earthenware Posset-pot inscribed 'Job Heath, 1702,'" and gave an interesting account of the potters of the Heath family in Staffordshire, mention being also made of earthenware gravestones which may be seen in the district of Burslem.—Mr. Fortnum then read a second paper, entitled "Notes on other Signacula of St. James of Compostella," this subject being treated by the author for the second time. It would appear that jet—the *azavache* of the Spaniards—is indigenous to Spain as well as to France and England; and Mr. Fortnum's fine examples of figures of St. James carved in this intractable material, and emanating from Compostella about the middle of the sixteenth century, show that the material was both plentiful and held in high estimation. The closing of monastic institutions in Italy appears to have brought to light many hitherto hidden objects of rarity and value. Mr. Sparvel-Bayley read a paper "On Hadleigh Castle in Essex," giving a careful historical and architectural account of this little-known fortress. Its whole history, it was shown, may, however, be found inscribed upon the public records, and it seems probable that Hadleigh Castle owed its erection to the master mind of William of Wykeham. But Wykeham's building took the place of an old structure, built by Hubert de Burgh in the early part of the thirteenth century. It finally passed from the Crown in the time of Edward VI. —The Chairman exhibited some fine enamels and bronzes from the Summer Palace, and personal ornaments from the South Sea Islands.—The Rev. A. Orlebar sent a fine tilting-helm with the wooden crest of Sir John Gostwick, Master of the Horse to Henry VIII., as well as a close helmet of the time of Charles I., of a later member of that now extinct family, from their tombs in Willington Church, Beds.—Mr. Thompson Watkin sent a photograph and notes on a remarkable inscribed stone of the time of Septimus Severus, found at Brough, Westmoreland, the Veteræ of the Romans.

CHEMICAL SOCIETY.

Nov. 4.—Prof. H. E. Roscoe in the chair.—The following papers were read: "On the Compounds of Vanadium and Sulphur," by Mr. E. W. E. Kay,—"On the Atmospheric Oxidation of Phosphorus, and some Reactions of Ozone and Peroxide of Hydrogen," by Mr. C. T. Kingzett: the author concludes that in the above oxidation both ozone and peroxide of hydrogen are formed; the former passes on in the current of air, the latter remains in the water in which the phosphorus is oxidized: in several experiments the proportion of peroxide of hydrogen to the ozone formed was as 1 to 2,—"On the Action of Zinc Ethyl on Benzoylic Cyanide." by Messrs. E. Frankland and D. A. Louis,—"On Bismuth and Bismuth Compounds," by Messrs. M. M. P. Muir, G. B. Hoffmeister, and C. E. Robbs,—"On the Colour Properties and Relations of the Metals Copper, Nickel, Cobalt, Iron, Manganese, and Chromium," by Mr. T. Bayley, —"Action of Diazonaphthalin on Salicylic Acid," by Mr. P. Frankland,—"On the Bari-Sulphates of Iron," by Mr. S. Pickering,—"Fourth Report on Researches in Chemical Dynamics," by Messrs. C. R. A. Wright and A. E. Menke,—"On some Naphthalin Derivatives," by Messrs C. E. Armstrong and N. E. Graham,—and "On Acetylorthoamidobenzoic Acid," by Messrs. P. P. Bedson and A. J. King.

PHILOLOGICAL SOCIETY.

Nov. 5.—Mr. A. K. Ellis, President in the chair.—Mr. H. Sweet opened the adjourned discussion on spelling reform. He reviewed the temporary decisions arrived at by the meetings last July, read from his printed "Further Notes on English Spelling," that had been sent to all members, passages from Caxton and Shakspeare in his altered spelling, but in the pronunciation of their respective times, and moved his printed resolutions on "Immediate Reforms of English Spelling." After much discussion, the first three of these were carried in the following form: 1. That an immediate partial phonetic reform of English spelling is most desirable and practicable. 2. That one of the chief objects of such a reform is to facilitate the acquisition of English spelling. 3. That the Society does not pledge itself not to go beyond the principle of etymological limitation in certain cases.—The discussion will be resumed on November 19th.

INSTITUTION OF CIVIL ENGINEERS.

Nov. 9.—Mr. W. H. Barlow, President, in the chair.—The paper read was "On Machinery for Steel-making by the Bessemer and the Siemens Processes," by Mr. B. Walker. —The Council reported that they had since the last announcement transferred six gentlemen from the class of Associated Members to the class of Members, and had admitted thirty-eight Students.

SOCIETY OF BIBLICAL ARCHÆOLOGY.

Nov. 2.—At the opening meeting of the session 1880-81, the Secretary, in the absence of the author, Rev. A. H. Sayce, read the following communication: "On the Bilingual Hittite and Cuneiform Inscription of Tarkondemos." Dr. Mordtmann appears to have been the first (1862) to describe the boss bearing the inscription of Tarkondemos. At that time it was in the possession of M. Alexander Jovanoff, of Constantinople, who had obtained it at Smyrna. Made of very thin silver, 16½ "English lines" in diameter, circular in form, like half an orange, he thought it must have served as the knob of a staff or dagger. The outer surface was divided into two fields, the inner and larger of which had the figure of a clothed warrior standing erect in the centre, holding a spear in the left hand, and surrounded by a series of "symbols." Mr. Sayce, having come across the description, and recognised the Hittite character of the object with some difficulty found the periodical in which the copy of it appeared, but his doubts as to its genuineness were not satisfied until he had compared Mordtmann's plate with the various casts extant. This comparison at once satisfied him that the copy we possess is as good as the original itself. The cuneiform legend he read as follows, "Tarrik Timme, King of the country of Erme."—M.. T. Tyler, M.A., read a paper "On the Inscription of Tarkutimme, and the monuments from Jerablus, in the British Museum."—Remarks were added by Rev. W. Wright. R. Cull, Rev. C. J. Ball, Dr. Birch, and the Secretary reminded the meeting that those who had seen the original silver boss had pronounced it a forgery: under any circumstances it could hardly be thonght to be of the age stated. He also mentioned that the Society had a quantity of "Hittite" type in progress of manufacture, and hoped at an early date to publish correct plates of both the inscriptions from Hamath and Jerablus.

ENGLISH SPELLING REFORM ASSOCIATION.

Nov. 9.—Mr. A. J. Ellis in the chair.—Mr. E. Jones read a paper on the necessary conditions in a better system of spelling intended for use in public elementary schools. These conditions were that each recognized sound should have a distinctive symbol; that the new spelling should be one that could be easily and readily printed; that it should be adaptable to both writing and printing; and that children taught by it should be enabled to pass readily to the ordinary spelling. The language at present was to a large extent spelled phonetically, and the exceptions could be levelled with comparatively small change. If, therefore, reformers confined themselves to adapting the existing material which was sufficient for the purpose, a better system could be devised without difficulty.

ASTRONOMICAL SOCIETY.

Nov. 12.—Prof. Cayley, V.P., in the chair. Messrs. H. A. Severn, B. F. Cobb, and the Rev. F. B. Allison, were elected Fellows. —The Astronomer-Royal described an instrument of Flamsteed's, of which he possessed an engraving that appeared to be unique. He stated that he believed this instrument marked an epoch in the history of astronomy. Before the invention of clocks which could be relied upon for the determination of time over periods of a day or longer, right ascensions had to be measured by the triangulation of stars; there was never any difficulty in determining the polar distances of stars with a graduated arc in the meridian. Having determined the polar distances of two stars, the distance between them was measured with a moveable arc, and the difference of right ascension found by calculation Tycho possessed an instrument for measuring such distances; but it was only provided with sights, and it was mounted on a vertical axis. This instrument of Flamsteed's was mounted on a polar axis, which projected beyond its bearings. On the top of the axis was a movable T head, carrying the graduated arc with two telescopes. The moveable T head could be inclined by a rack and screw motion, so as to enable the observer to measure the distance between two stars which differed in declination The instrument was only used for determining the places of the principal stars, and a clock which would go pretty well for some hours was used for determining the differences of right ascensions of smaller starsas measured from the larger ones. Flamsteed was succeeded by Halley, who relied entirely upon the places of principal stars as determined by Flamsteed, and filled up the interspaces by means of observations made with a curious transit instrument, with axes of unequal length. The great reform in the method of determining the positions of stars was brought about by Graham, the clockmaker, who invented the dead-beat escapement and the gridiron pendulum, which enabled right ascensions to be determined all round the heavens by observing the times of transit with a meridian instrument.—Mr. Knott read a paper entitled "Observations of Ceraski's new Variable Star in Cephus," The star is of the Algol type, and comes to its minimum every two and a half days; it remains constant in brightness for the greater part of the period, and then suddenly decreases in brightness, remaining for a short time at its minimum brightness, and then rapidly increases again.—Mr. Common read a paper on the method of mounting his great 3-ft. reflecting telescope —Mr. E. J Stone read a paper "On a Determination of the Coefficient of the Parallactic Inequality in the Expression for the Moon's Longitude"; and Capt. Noble read a note "On a Phenomenon of Jupiter's Satellites," He mentioned that on recently observing the planet when the shadows of two satellites were projected upon the disc, he had noticed that one of the shadows was of a chocolate brown colour, while the other appeared perfectly black.—Mr. Campbell corroborated Capt. Noble's observation with respect to the difference in tint of the two shadows.

ASIATIC SOCIETY.

Nov. 15.—Sir H. C. Rawlinson President, in the chair.—Sir W. R. Robinson, Mr S. S. Thorburn, Capt. R. G. Gill, R.E., and the Rev. M. Argles, were elected Resident Members; and the Bishop of Lahore, Lieut. H. E. McCallum, Dr. S. W. Bushell, and Abd-er-rahman Moulvie Syed, Non-Resident Members.—Prof. Monier Williams read a paper "On Indian Theistic Reformers."

LINNEAN SOCIETY.

Nov. 4.—Prof. Allman, F.R.S., President, in the chair.—Messrs. Edw. Brown, H. E. Dresser, and F. Pippe were elected Fellows of the Society.—Mr. H. C. Sorby showed drawings of some British Sea anemones, with habitat on the upper fronds of long seaweeds in deep water; and he recorded having seen a solitary cream-coloured Cetacean on the English coast. Mr. Arthur Bennett drew attention to a new British Chara (*C. stelligera*), remarkable for the presence of stellate bulbils on the stems.—Mr. E. M. Holmes exhibited two marine Algæ new to Britain, viz., *Kasya Gibbesii* from Berwick-on-Tweed and *Ectocarpus terminalis* from Weymouth; and also species of Callithaminon with antheridia and trichophore on the same branchlet.—Prof, T. S. Cobbold exhibited a remarkable Trematode from the horse, discovered by Dr. Sonsini at Zagazig during the Egyptian plague, with which outbreak, however, the parasite had no necessary connexion. The worm (*Gastrodicus Sonsinonis*) appears to be an aberrant Amphistome furnished with a singular central disc, whose concavity was lined with about two hundred small suckers, altogether having a tesselated aspect. In this respect its nearest approach was a worm infesting a genus of spiny-finned fishes (Cataphractus) belonging to the Triglidæ. According to Prof. Leuchart's recent anatomical investigation doubts, however, are thrown on its amphistomoid affinities.—Mr. G. F. Angas showed the leaf of *Hermas gigantea*, an umbelliferous plant of the Cape, used as tinder by the Hottentots.—Mr. E. A. Webb exhibited a monstrous bramble (*Bubus fruticosus*) with flowers represented by elongated axes covered with minute pubescent bracts and apices faciated.—A paper by Dr. Geo. Watt, "Contribution to the Flora of North-West India," was read. He divides the district into three areas. The first range, Ravee-Basin, with forests of *Cedrus deodara* on its northern slopes, has on the southern ones vegetation with an Indian facies, being barely outside the humid influence of the tropical rains of the plains. The second range, comprising Pangi, Lower Lahore, and British Lahore, has a flora altogether changed, dry short summers and snow-clad mountains giving a climate and plant life of quite a different cast. In the third range the flora assumes a Thibetan type. Some three hundred species of plants are noted, four being new.—A paper "On the Papilionidæ of South Australia," by J. G. Otto Tepper, was read. The butterflies of this part of Australia are comparatively few, and sombre colours prevail.—"Notes on a Collection of Flowering Plants from Madagascar" was read by Mr. J. G. Baker. The flowering plants are less known than the ferns from this interesting Island; two new genera are now denoted, viz., 1. Kitchingia, belonging to the Crassulaceæ, a succulent herb with fleshy sessile leaves and large bright red flowers in lax terminal cymes; Rodocodon, a liliaceous plant with red flowers and peculiar spurred bracts; it comes between Muscaria and Urginea. Thirty new species are described.

MATHEMATICAL SOCIETY.

Nov. 11.—C. W. Merrifield, Esq., President, in the chair. After the Treasurer's and Secretaries' Reports had been read and adopted, the meeting proceeded to the election of the new Council. Mr. G. Roberts, the new President, having taken the chair, Mr. Merrifield read his valedictory address, "Considerations respecting the Translation of Series Observations into Continuous Formulæ." On the motion of Prof. Cayley the address was ordered to be published in the *Proceedings*.—Mr. H. M. Jeffery read a paper "On Bicircular Quartics, with a Triple and Double Focus and Three Single Foci, all of them Collinear."—Mr. Tucker read parts of a paper by the Rev. C. Taylor, entitled, "Further Remarks on the Geometrical Method of Reversion."

INSTITUTION OF SURVEYORS.

Nov. 8.—The President, Mr. E. Ryde, opened the session with an address.—Mr. R. Keirle was elected a Member.